

ECHINOCARIS, A MID-PALEOZOIC CRUSTACEAN: AN ANNOTATED BIBLIOGRAPHY

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Abstract

Echinocaris is a genus of malacostracan crustacean that has been reported in rocks ranging in age from Early Devonian through Early Mississippian in North America, Europe, Asia, and New Zealand. More than 200 citations in primary and secondary literature have focused on one or more aspects of the taxon including its morphology, paleoecology, and phylogenetic position. This annotated bibliography represents a compilation of citations to works on the taxon and summarizes important observations in each reference.

Introduction

Purpose

The genus *Echinocaris* embraces a small group of malacostracan arthropods known exclusively from the fossil record of the mid-Paleozoic. Twenty-seven species have been formally assigned to the genus and more than 20 citations have associated specimens with *Echinocaris*, which were so poorly preserved as to preclude precise identification. Of those identified and described, probably more than 15 are valid species. The remainder are either synonymous with valid taxa or are assignable to different organisms. The described species range in age from Early Devonian through Early Mississippian. Although the preponderance of taxa have been described from marine rocks in the central and eastern United States, some have been identified in Canada, Great Britain, the Soviet Union, Burma, and New Zealand.

Thus, the echinocaridids are a relatively small group of organisms that one might assume would occupy a relatively insignificant position in the study of earth history. On the contrary, *Echinocaris*—or taxa that at one time were referred to the genus—and trace fossils presumed to be due to the activity of *Echinocaris* have been cited in more than 200 technical and nontechnical publications.

Echinocaris has often been illustrated (Fig. 1), and has been selected by authors as either the sole example, or one of a few examples, of Paleozoic crustaceans. Reference to the genus is made, not only in the primary literature, but also in a number of textbooks of paleontology and historical geology published in the last 100 years.

The prominence of *Echinocaris* in the literature probably stems, in part, from the influential role played by classical, early American paleontologists, such as James Hall, Robert Parr Whitfield, and John Clarke. Their work not only formed the basis for description of the rich and varied Devonian faunas of northeastern United States but also helped to set the standard of excellence for subsequent paleontological work in America. These authors described in detail, and considered the implications of, *Echinocaris* in the record of Devonian rocks.

With the exception of the trilobites and the eurypterids, *Echinocaris* was probably the most common large arthropod to be collected from Paleozoic rocks. As such, the taxon was recognized early as a potential ancestor to subsequent malacostracans and thus, served as a splendid illustration of the rootstock of this group. It was also recognized, in the nineteenth century, that *Echinocaris* bore resemblance to the living leptostracans, including *Nebalia* and its allies. The presumed central position of *Echinocaris* in the phylogeny of the Malacostraca and its morphological similarity to living phyllocarids, coupled with its large size and distinctive morphology, rendered the genus a useful and lasting example of early arthropod.

Because of the extraordinary prominence of *Echinocaris* in the literature and because the genus has been cited as the possible precursor to subsequent crustacean groups it is appropriate to focus attention on the knowledge of the group accumulated since the first specimens of *Ceratiocaris* [= *Echinocaris*] *punctata* were described by Hall in 1863. The purposes of this work, therefore, are to present

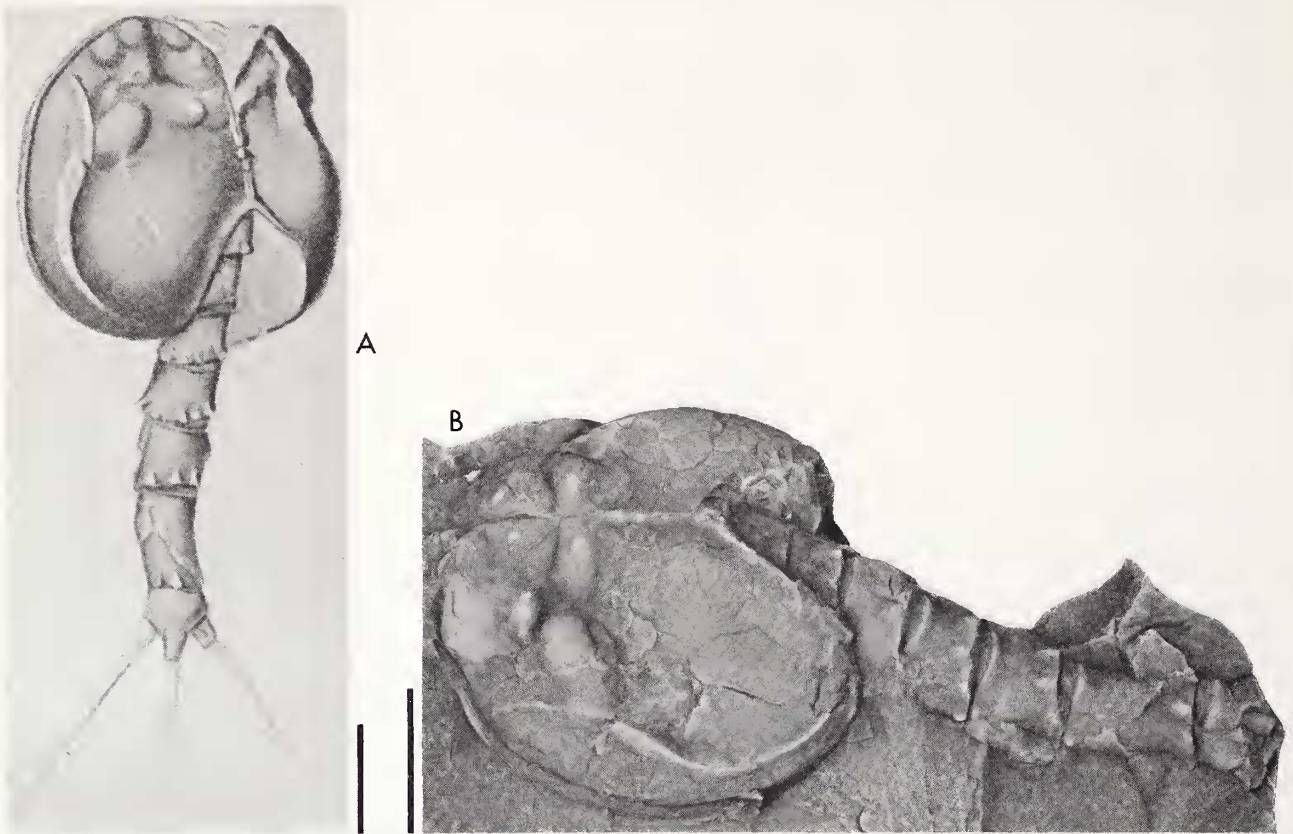


Fig. 1. *Echinocaris punctata* (Hall, 1863). A. Reproduction of the original illustration by Beecher (1884, Plate I, fig. 13), which is the most widely reproduced, and probably the best known, illustration of a specimen of *Echinocaris*. Beecher described the specimen as, "a nearly entire individual showing the form and relation of the parts, and the number of naked abdominal segments." B. Photograph of the specimen of *E. punctata*, New York State Museum 13342/4 (old number, NYSM4401), from which the drawing was made. Bar scales = 1 cm.

as complete a bibliography of the genus *Echinocaris* as possible and to provide annotations summarizing the significant systematic, morphologic, stratigraphic, and ecologic observations in these works. Additionally, trace fossils ascribed to the work of *Echinocaris* spp. and taxa previously thought to be included within *Echinocaris* (particularly ?*Dunsophterus wrightianus* and *Eleuthero-caris wrightiana*) are treated. Finally, because many of the references cited treat a broad spectrum of Paleozoic arthropods, the bibliography will serve as a general entry into the literature of early malacostracans.

Annotation procedure

Every attempt has been made to secure as complete a bibliography on *Echinocaris* as possible. Standard bibliographic sources, such as the *Bibliography and Index of Geology* and its precursors, including the *Bibliography of North American Geology* and the *Bibliography and In-*

dex of Geology Exclusive of North America, as well as the *Zoological Record* and Van Straelen and Schmitz's *Fossilium Catalogus* (1934) on phyllocarids, served as the basic resources. Additionally, references within articles on Paleozoic arthropods were searched for citations of the genus. Examination of stratigraphical and general paleontological articles relevant to the units known to contain echinocaridids provided additional references. A number of references were also drawn from W. D. I. Rolfe's manuscript of an updated manuscript *Fossilium Catalogus* on phyllocarids.

Each of the citations has been examined to provide detailed page references to significant information relative to *Echinocaris*. Although these page citations refer to nearly all mentions of the genus, some passing notices have not been cited in situations where more inclusive or specific record is made in the same work. We have attempted to identify citations in textbooks and nontechnical literature, but we have not attempted to confirm ci-

tations in every edition of every textbook. Unpublished theses, with the exception of two which contain important, relevant remarks, are not included. In all cases, the original materials, or photocopies of the original materials, have been examined so that errors of citation in secondary literature have been identified and eliminated. Original spellings have been preserved and, where incorrect, corrected spellings are indicated in square brackets. When the trivial portion of species names have been derived from the names of individual people, and their initial letter was capitalized in the original article or book, they are not capitalized here (nor is this considered a misspelling herein). Authors of species, when not supplied by authors cited, are added.

Two kinds of documenting information are given within the annotations. References to previous works and acknowledgments of illustrations cited by the author are presented in the text or are set off by parentheses. Those that were not cited by the original author, but are inserted by us, are set off by square brackets. Additionally, comments intended to clarify points of misinterpretation in the original text, to correct misspellings, or to guide the user to other, relevant references are placed in square brackets. Specimen numbers and depositories, when not provided previously in the literature, if known to us, are also provided in square brackets.

To avoid misunderstanding, we have attempted to utilize standard terminology with reference to citations. Thus, when the term, "after" is used, it means that illustrative material has been taken directly from a previous author, without modification. In the event that illustrations have been altered, but an original source can be identified, we have used the terminology, "modified from."

Cross references are included where a paper could be construed as having been written by an author other than the first author listed. Also, cross references are provided where an author's name may have varied spellings in English.

Acknowledgments

W. D. I. Rolfe, The Royal Museum of Scotland, Edinburgh, generously allowed Hannibal access to his extensive files on *Echinocaris*, including his manuscript copy of an updated *Fossilium Catalogus* on phyllocarids, at an early stage of this work. Natalie Sidel, Cleveland Public Library, provided translations of materials in Russian. Rolfe, Loren Babcock, then at Kent State University, D. E. Butler, then with the British Geological Survey, and Andrew K. Rindsberg, Golden, Colorado, provided us with copies of important articles. Roy E. Plotnick, the University of Illinois, Chicago, provided information on *Dunsophterus wrightianus*. Kathleen M. Farago, Lakewood Public Library, provided invaluable assistance with proofreading. Rolfe and Murray J. Copeland, Geological

Survey of Canada, provided helpful reviews of this paper. This work was supported by NSF Grant EAR 8312798 to Feldmann. A portion of this study was supported by a Cleveland Museum of Natural History Staff Enhancement Award, funded by Mr. and Mrs. Willard Hirsh, to Hannibal. Contribution 312, Department of Geology, Kent State University, Kent, Ohio 44242.

Bibliography

Allan, R. S. 1935. The fauna of the Reefton beds (Devonian), New Zealand; with notes on Lower Devonian animal communities in relation to the base of the Devonian System. *New Zealand Department of Scientific and Industrial Research, Geological Survey Branch, Palaeontological Bulletin* 14:1-72.

Reported, based on an elongate, tapering, cercopod (p. 30; Pl. III, fig. 8), *Echinocaris* sp. indet. from the

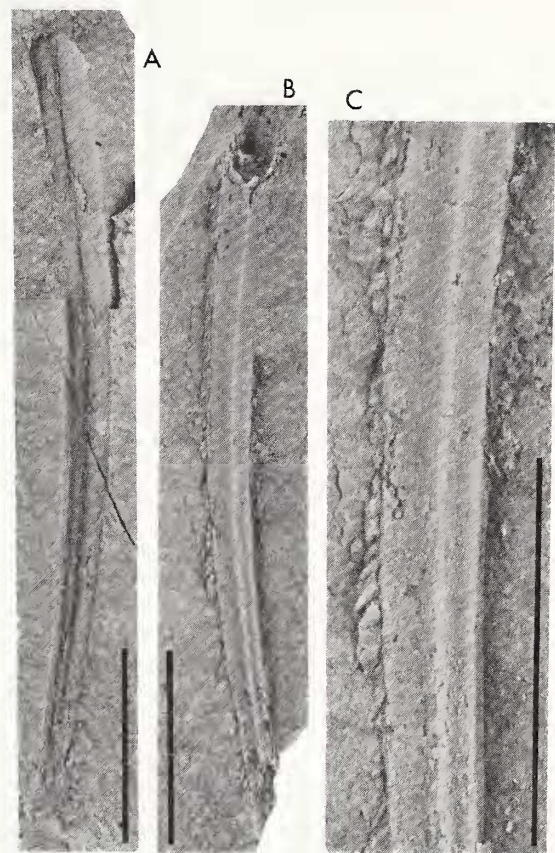


Fig. 2. Illustrations of an arthropod spine (New Zealand Geological Survey AR1131), originally identified by Allan (1935, p. 30) as *Echinocaris* sp. indet. The specimen does not, however, seem to be referable to *Echinocaris*. A. Counterpart of the sole specimen. B. Specimen illustrated by Allan (1935, Plate 3, fig. 8). C. Enlargement of a portion of the specimen illustrated in B showing articulated spinelets arranged along the convex margin of the spine. Bar scales = 1 cm.

- Reefton beds of New Zealand. [The specimen, No. AR 1131 in the collection of the New Zealand Geological Survey, is from the Bolitho Mudstone Formation, Middle Siegenian to Lower Emsian (Fig. 2). It is five or more sided and bears spinelets that are less than one mm long on at least two of these sides. It may be a phyllocarid telson-spine, but it is unlike that of any *Echinocaris* species.]
- Baird, G. C. 1978. Pebbly phosphorites in shale: a key to recognition of a widespread submarine discontinuity in the Middle Devonian of New York. *Journal of Sedimentary Petrology* 48:545–555.
Reported (p. 548) the uppermost portion of the Kashong Shale Member of the Moscow Formation in western New York state to be, “characterized by the brachiopods *Tropidoleptus carinatus* and *Lingula* sp., ramose and fenestrate bryozoans, the trilobites *Greenops boothi* and *Dipleura dekayi*, and the phyllocarid *Echinocaris* sp.”
- _____. 1979. Sedimentary relationships of Portland Point and associated Middle Devonian rocks in central and western New York. *New York State Museum Bulletin* 433:1–24.
Noted (p. 12) *Tropidoleptus*, *Pleurodictyum* [sic], *Modiomorpha*, *Pseudoaviculopecten*, *Orthonata* [sic], *Grammysia* and *Echinocaris* as common taxa in the Middle Devonian Kashong Member of the Moscow Formation in central and western New York.
- Barrois, C. 1891. Mémoire sur la faune du grès armoricain. *Annales de la Société Géologique du Nord* 19:134–237.
Compared *Trigonocarys lebescontei* n. gen. and sp. with some other phyllocarids, including (p. 224) *Equisitides* [= ?*Dunsopterus wrightianus*] and (p. 225) *Echinocarys* [= *Echinocaris*; Rolfe, 1969, noted that *Echinocarys* was a nomen vanum].
- Barron, L. S., and F. R. Etensohn. 1980. *A bibliography of the paleontology and paleoecology of the Devonian-Mississippian black-shale sequence in North America*. U.S. Department of Energy, Morgantown Energy Technology Center, DOE/METC/5202-13, 86 p.
Listed several publications dealing with, or mentioning, *Echinocaris*.
- _____. 1981. *Paleoecology of the Devonian-Mississippian black-shale sequence in eastern Kentucky with an atlas of some common fossils*. U.S. Department of Energy, Morgantown Energy Technology Center, DOE/ET/12040–151, 75 p.
Noted (p. 21) that, “fossils such as *Echinocaris* and *Spathiocaris* are commonly reported from the black shales” and that, “if they were indeed crustaceans, they probably led a nektonic life in the upper part of the water column of the black-shale sea and were associated with flotage as are modern arthropods in the Sargasso Sea.” [*Echinocaris* is certainly a crustacean. However, unlike *Spathiocaris*, it is not commonly found in classic black shales, such as the Cleveland Shale; see also Hlavín, 1976.]
- Bate, R. H., J. S. H. Collins, J. E. Robinson, and W. D. I. Rolfe. 1967. Arthropoda: Crustacea. In *The Fossil Record*, p. 535–563. Geological Society of London.
Noted (p. 555) the range of the order Archaeostraca Claus to be Tremadocian through Carnian.
- Bather. See British Museum (Natural History).
- Beecher, C. E. 1884. Ceratiocaridae from the Chemung and Waverly groups of Pennsylvania. *Second Geological Survey of Pennsylvania, Report of Progress*, PPP:1–22.
Reviewed (p. 1–3) literature on Paleozoic “phyllopods,” discussed (p. 3–4) “the optic spot” of these crustaceans, and listed (p. 5) geologic ranges for *Echinocaris punctata* (Hall), *E.* [= “*Ceratiocaris*”] *longicauda* Hall [see Hall, 1863], *E. sublevis* Whitfield, *E. pustulosa* Whitfield, *E. multinodosa* Whitfield, and *E. socialis* Beecher. Redescribed *E. punctata* (p. 6–10; Pl. I, figs. 13–16) [Fig. 1 herein] from the Hamilton Group of New York and described *E. socialis* n. sp. (p. 10–13; Pl. I figs. 1–12) from the shales at the base of the Chemung Group at Warren, Pennsylvania. Also described mandibles (p. 9–10; Pl. 2, figs. 9–11) associated with specimens of *E. punctata*, but belonging to “a species otherwise unknown.” Presented (p. 4) a labeled, diagrammatic illustration of *Echinocaris*. [Museum numbers for *E. socialis*, Pl. I, figs. 5 and 6, *E. punctata*, Pl. I, figs. 13–16, and for the mandibles, Pl. II, figs. 9–11, are given in Clarke and Ruedemann, 1903. These authors listed the mandibles as *E. punctata*.]
- _____. 1900. Restoration of *Stylonurus lacoanus*, a giant arthropod from the Upper Devonian of the United States. *American Journal of Science*, Fourth Series, 10:145–150. Also, *Geological Magazine*, New Series, 7(XI):481–485.
Discussed (p. 148) *Stylonurus* (?) (*Echinocaris*?) [= ?*Dunsopterus*] *wrightianus* (Dawson), suggesting that the type specimen represents two proximal joints of one of the large crawling feet of a form related to *Stylonurus*.
- _____. 1902. Revision of the Phyllocarida from the Chemung and Waverly groups of Pennsylvania. *Quarterly Journal of the Geological Society of London* 58:441–449.
Described *Echinocaris randallii* n. sp. (p. 443; Pl. XVIII, fig. 8) and *E. clarkii* n. sp. (p. 443–444; Pl. XVIII, fig. 9) from the Waverly Group, Lower Carboniferous, near Warren, Pennsylvania. Both forms were compared to *E. socialis* Beecher. *E. clarkii* was also compared to *Pephracaris horripilata* Clarke.

- Also presented additional information on the morphology of *E. socialis* (p. 441–442; Pl. XVII; Pl. XVIII, figs. 1–7) based on specimens from the “phyllocarid-beds” in the Upper Devonian Chemung Group at Warren, Pennsylvania. [Beecher’s primary type, and figured, specimens are in the Peabody Museum of Natural History, Yale University.]
- Bernard, F. 1895. *Éléments de Paléontologie*. Librairie J.-B. Baillière et Fils, Paris, 1168 p.
Diagnosed (p. 328) *Echinocaris* and provided (fig. 159A) a labelled, diagrammatic illustration [modified from Beecher, not Beecker, 1884] of *E. punctata* (Hall).
- Bigsby, J. J. 1878. *Thesaurus Devonico-Carboniferus: The Flora and Fauna of the Devonian and Carboniferous Periods*. John van Voorst, London, 447 p.
Listed (p. 26) *Ceratiocaris armata* Hall [= *Echinocaris punctata* (Hall)] and *Ceratiocaris punctata* Hall [= *Echinocaris punctata* (Hall)] from New York State, after Hall, 1863.
- Bolton, T. E. 1966. *Catalogue of Type Invertebrate Fossils of the Geological Survey of Canada*. Vol. III. Geological Survey of Canada, Department of Mines and Technical Surveys, Ottawa, 203 p.
Listed (p. 115) type and figured specimens of *Echinocaris beecheri* Copeland, *E. castorensis* Copeland, *E. consanguina* Eller, and *E. sp.* figured and described by Copeland in Copeland and Bolton, 1960. [See Copeland, 1960a.]
- Boule, M., and J. Piveteau. 1935. *Fossiles: Éléments de Paléontologie*. Masson et cie, Paris, 899 p.
Mentioned (p. 175) *Echinocaris* as a Devonian malacostracan.
- British Museum (Natural History). 1907. *A Guide to the Fossil Invertebrate Animals in the Department of Geology and Palaeontology in the British Museum (Natural History)*. . . . The Trustees of the Museum, London, 182 p.
Noted (p. 95) that the shield [carapace] of *Echinocaris* is bivalved. “This book has been written by Dr. Francis Arthur Bather . . .” [from the Preface].
- . 1911. *A Guide to the Fossil Invertebrate Animals in the Department of Geology and Palaeontology in the British Museum (Natural History)*. . . . Second Edition. The Trustees of the Museum, London, 183 p.
Made the same comments (p. 95) as in the entry above. “The First Edition of this Guide . . . was written by Dr. Francis Arthur Bather . . . who has also . . . revised the book for this, the second, Edition” [from the Preface].
- Brooks, H. K. 1957. Chelicerata, Trilobitomorpha, Crustacea (exclusive of Ostracoda) and Myriapoda. In *Treatise on Marine Ecology and Paleoecology*, Volume 2, Paleoecology, edited by H. S. Ladd, p. 895–929. Geological Society of America Memoir 67.
Noted (p. 898) the burrows on the carapace of a specimen of *Echinocaris punctata* (Hall) shown in Clarke, 1919 [= Clarke, 1921].
- Brown, R. W. 1956. *Composition of Scientific Words*. Revised edition. Smithsonian Institution Press, Washington, D.C., 882 p.
Included (p. 235) *Echinocaris punctata* (Hall) as an example of an animal named using the Latin *caris*.
- Buehler, E. J., and I. H. Tesmer. 1963. Geology of Erie County, New York. *Buffalo Society of Natural Sciences Bulletin* 21 (3):1–118.
Listed (p. 51) *Echinocaris punctata* (Hall) and *E. sp.* as occurring in the Ledyard Shale Member and (p. 56) *Echinocaris punctata* (Hall) and “mandibles of *Phyllocaris*” [sic] as occurring in the Middle Devonian Wanakah Shale Member of the Ludlowville Formation in Erie County, New York. Other taxa, including additional phyllocarids, occurring in these units are also listed.
- Butler, D. E. 1980. North Devon Athenaeum — Barnstaple, B. Figured Devonian fossils in the collections. *The Geological Curator* 2(9–10):588–592.
Listed (p. 591) specimens of *Echinocaris whidbornei* Jones and Woodward and *E. sloliensis* Partridge, figured by Partridge (1902), as being in the collections of the North Devon Athenaeum. Supplied specimen numbers.
- . 1981. Marine faunas from concealed Devonian rocks of southern England and their reflection of the Frasnian transgression. *Geological Magazine* 118: 679–697.
Reported *Echinocaris* from Frasnian or early Famennian rocks from the Little Chishill borehole (p. 689), Essex, England and the Steeple Aston borehole (p. 691), Oxfordshire, England.
- Carll, J. F. 1883. Geological Report on Warren County and the neighboring oil regions with additional oil well records. *Second Pennsylvania Geological Survey Report*: 1–439.
Included (p. 304–307) a description of a stratigraphic section of the rocks in the Warren area by F. A. Randall. Reported (p. 306) crustaceans (*Ceratiocaris*?) from division R at Tanner’s Hill near the brewery in western Warren. Also reported (p. 304) that fossils given to the state museum by Randall were keyed to this section. [The brewery mentioned was probably that of Adolph Saltsman, once located in King’s Hollow. The rocks noted as containing crustaceans are in the Conewango Formation (=Chadakoin & Venango formations). The crustaceans probably included one or more of the species of *Echinocaris* described in Beecher, 1884 and/or 1902, although it is not possible to reconcile Ran-

- dall's section with the exact horizons given by Beecher.]
- Case, G. R. 1982. *A Pictorial Guide to Fossils*. Van Nostrand Reinhold, New York, 515 p.
- Suggested (p. 130–132) *Pseudodontichthys whitei* Skeels to be a junior synonym of *Echinocaris*. [This is probably incorrect; see Rolfe and Denison, 1966.] Illustrated (fig. 15–3) a specimen of *P. whitei* from the Silica Shale from Milan, Michigan and (fig. 15–6) *Echinocaris socialis* Beecher from the Upper Moravian beds of the Tully Limestone, Ithaca Group, Moravia, New York. [The latter specimen is not *E. socialis*. It is, however, comparable to *E. punctata* (Hall).]
- Caster, K. E. 1930. Higher fossil faunas of the Upper Allegheny. *Bulletins of American Paleontology* 15(58): 1–332.
- Listed and illustrated *Echinocaris socialis* Beecher (p. 97; Pl. 55, figs. 4, 6–8 after [modified from] Beecher, 1902) from the “Chemung Group” at Warren, Pennsylvania and *E. clarkii* Beecher (p. 97; Pl. 54, fig. 5 after [modified from] Beecher, 1902) and *E. randalli* Beecher [= *E. randallii*] (p. 98; Pl. 55, fig. 5, after [modified from] Beecher, 1902) from the Waverly Group at Warren.
- _____. 1934. The stratigraphy and paleontology of northwestern Pennsylvania. Part I: Stratigraphy. *Bulletins of American Paleontology* 21(71):1–185.
- Listed (p. 75) the following occurrences of *Echinocaris* in the “Bradfordian fauna” of Ohio, Pennsylvania, and New York; *E. socialis* Beecher in the Upper Chadakoin (Ellicott) Member, *E. socialis?* and *E. clarkii?* Beecher in the Amity Shale Member, and *E. randalli* Beecher [= *E. randallii*] in the Oswayo—lower Riceville Member and the Cussewago series.
- Chadwick, G. H. 1935. Faunal differentiation in the Upper Devonian. *Bulletin of the Geological Society of America* 46:305–342.
- Listed *Eleutherocaris whitfieldi* (Clarke) and *Ceratiocaris*(?) [= “*Ceratiocaris*”] *beecheri* as a diagnostic species (p. 315) and *Echinocaris punctata* (Hall) as a nondiagnostic and last-appearing species of the Naples Group (p. 317). Listed *Echinocaris condylepis* Hall and Clarke as a diagnostic species of the Canadaway Group (p. 325), *Echinocaris socialis* Whitfield as a diagnostic species of the Conewango Group (p. 330), *Echinocaris clarkii* Beecher and *E. randalli* Beecher [= *E. randallii*] as diagnostic of the Cussewago-Knapp (p. 366), and *Stylonurus* (?) [= “*Dunsophterus*”] *wrightianus* (Dawson) diagnostic of the Chemung Group (p. 320).
- Chamberlin, T. C., and R. D. Salisbury. 1905 (a publication date of 1907 is indicated on the title page). *Geology*. Vol. II, Earth History. Genesis—Paleozoic. Second Edition, Revised. Henry Holt and Company, New York, 692 p.
- Noted that, in contrast to trilobites, phyllocarids and cirripeds were amply represented in the Hamilton fauna (p. 473), illustrating (fig. 210a) *Echinocaris punctata* (Hall) [modified from Beecher, 1884].
- _____. 1909. *A College Text-book of Geology*. Henry Holt and Company, New York, 978 p.
- Illustrated (fig. 419d) [modified from Beecher, 1884] *Echinocaris punctata* (Hall) on a figure showing “representative Hamilton fossils,” and referred to the species as, “a crustacean more highly organized than the trilobites.”
- Chernyshev. See Tschernyshev
- Chhibber, H. L. 1934. *The Geology of Burma*. McMillan, London, 538 p.
- Listed (p. 168) *Echinocaris asiatica* Reed as one of the most important fossils found in the Devonian Wetwin shales of Burma.
- Chlupáč, I. 1963. Phyllocarid crustaceans from the Silurian and Devonian of Czechoslovakia. *Palaeontology* 6(1):97–118.
- Corrected (p. 98, 113) the family name Echinocaridae Clarke (in Zittel, 1900) to Echinocarididae.
- Clarke, J. M. 1885a. A brief outline of the geological succession in Ontario Co., N. Y., to accompany a map. *Report of the [New York] State Geologist for the year 1884*: 9–22.
- Listed (p. 20) *Echinocaris* [= *Eleutherocaris*] *whitfieldi* Clarke as occurring in the “Portage” group in Ontario county.
- _____. 1885b. On the higher Devonian faunas of Ontario County, New York. *U. S. Geological Survey Bulletin* 16:1–86.
- Commented (p. 44–45) on *Echinocaris* and described *Echinocaris* [= *Eleutherocaris*] *whitfieldi* n. sp. (p. 45, Pl. II, figs. 3, 4) from the Devonian Naples beds at Hatch Hill, Naples, New York. [Clarke (1902) later erected the genus *Eleutherocaris* for this species.] Also described *Ceratiocaris* [= “*Ceratiocaris*”] *beecheri* n. sp. (p. 44, Pl. II, fig. 1) [see Clarke, 1892]. Noted (p. 66) that he had not found any specimens of *Equisetides wrightiana* Dawson [= “*Dunsophterus wrightianus*”] (Dawson)].
- _____. 1891. The fauna with *Goniatites intumescens*, Beyrich, in western New York. *The American Geologist* 8:86–105.
- Listed (p. 93) *Echinocaris* [= *Eleutherocaris*] *whitfieldi* Clarke and *E.?* *beecheri* Clarke [nomen nudum] as occurring in the *G. intumescens* fauna of the Naples beds. Noted, in introducing the list, that, “many interesting forms are undescribed and their affinities can only be indicated.” [*Echinocaris?* *beecheri* Clarke, 1891, not Copeland, 1960, has never been illustrated or described. Although it is probable that Clarke was referring to an undescribed form, it is possible that he could have been referring to “*Ceratiocaris*” *beecheri* Clarke, 1885.]

- _____. 1892. List of the original and illustrated specimens in the palaeontological collections, Part I—Crustacea. *45th Annual Report of the New York State Museum*: 373–437 and *11th Annual Report of the New York State Geologist*: 57–121.
Listed type and figured specimens (including reproductions) of crustaceans in the collections of the New York State Museum. Included, under the main heading *Echinocaris* (p. 427–430), specimens of *E. punctata* (Hall), mandibles of Phyllocarida (*E. punctata*), (?) *Ceratiocaris* [=“*Ceratiocaris*”] *longicauda* Hall, *Echinocaris* [=*Eleutherocaris*] *whitfieldi* Clarke, (?) *Ceratiocaris* [=“*Ceratiocaris*”] *beecheri* Clarke, *E. condylepis* Hall and Clarke, *E. socialis* Beecher, *E. multinodosa* Whitfield, *E. pustulosa* Whitfield, and *E. sublaevis* [=*sublevis*] Whitfield. [It is unclear why *C. beecheri* was listed under *Echinocaris*.] Also included, (p. 426) *Stylonurus?* (*Echinocaris?*) [=“*Dunsopterus*”] *wrightianus* (Dawson).
- _____. 1898a. The stratigraphic and faunal relations of the Oneonta sandstones and shales, the Ithaca and Portage groups in central New York. *New York State Museum, Forty-ninth Annual Report of the Regents*, 1895, 2:27–81.
Listed (p. 53) *Echinocaris* [=*Eleutherocaris*] *whitfieldi* Clarke, and *E. (?) beecheri* Clarke [nomen nudum; see Clarke, 1891] in a list of species of the normal Portage (Naples) fauna in Ontario and Livingston counties, New York.
- _____. 1898b. Notes on some crustaceans from the Chemung Group of New York. I. A singularly ornamented phyllocarid genus, *Pephricaris*. *New York State Museum, Forty-ninth Annual Report of the Regents*, 1895, 2:731–733.
Compared (p. 731–733) *Pephricaris horripilata* n. sp., from the Chemung Sandstone at Alfred, New York, with *Echinocaris*, and concluded that the new species was closely related to *Echinocaris*.
- _____. 1902. Notes on Paleozoic crustaceans, 3, some Devonian Phyllocarida from New York. *54th Report of the New York State Museum*, 1 (Appendix 3):97–103.
Noted (p. 98) that, although no phyllocarids were common in the Hamilton fauna, *Echinocaris punctata* (Hall) is more common than other species and found (p. 99) some Ithaca rocks at Laurens and near Noblesville crowded with *E. punctata* and *Rhinocaris columbina* Clarke. Also noted that these forms “in every recorded instance” are found in true marine faunas. Discussed (p. 103) the history of the name *Eleutherocaris*, noting that he had introduced the name in “Eastman-Zittel’s” *Text-book of Paleontology* for *Ceratiocaris* [=*Eleutherocaris*] *whitfieldi* Clarke [undoubtedly Clarke was referring to the taxon then known as *Echinocaris whitfieldi* Clarke; see Zittel, 1900] and briefly compared *Eleutherocaris* to *Echinocaris* (p. 103).
- _____. 1904. Naples fauna in western New York. *New York State Museum Memoir* 6:199–454.
Listed (p. 352) *Ceratiocaris* (*Echinocaris?*) as occurring in the Kellwasser Limestone of the Eifel area [Germany]. Included *Eleutherocaris whitfieldi* Clarke and *Stylonurus?* [=“*Dunsopterus*”] *wrightianus* (Dawson) in a list of taxa (p. 358) found in the Cashaqua shale in the Naples section. Listed (p. 360) *S.?* *wrightianus* and *E. whitfieldi* as occurring, rarely, in the Naples subprovince, and *Echinocaris?* *longicauda* Hall [=*E. punctata* (Hall)] as occurring in the *Styliola* or prencunial fauna of the Naples subprovince. Noted (p. 373) Whitfield’s description of *Echinocaris multinodosa*, *E. pustulosa*, and *E. sublaevis* [=*E. sublevis*] from the Huron [actually the Chagrin] Shale and that *Echinocaris* could be found in the Intumescens zone of New York.
- _____. 1905. Ithaca fauna of central New York. *New York State Museum Bulletin*, 82:53–70.
Listed (p. 61) *Echinocaris punctata* (Hall) as having been collected from the Ithaca beds at Norwich (p. 55) and Burdick (p. 58) and from the Sherburne Sandstone at Noblesville and Laurens (p. 59).
- _____. 1921. Organic dependence and disease; their origin and significance. *New York State Museum Bulletin*, 221–222:1–113. Also, Yale University Press, New Haven.
Illustrated (fig. 86) with a specimen of *Echinocaris punctata* (Hall) from the Hamilton Group, consisting of a single left valve, with marks of *Clionolithes* borings. [The cover gives a date of publication of 1919 in addition to 1921, thus this article is sometimes cited as being published in 1919. The specimen of *E. punctata* is Princeton University 89238, from the Moscow Shale, Smyrna, New York.]
- Clarke, J. M. See also Zittel, K. A.
- Clarke, J. M., and D. D. Luther. 1904. Stratigraphic and paleontologic map of Canandaigua and Naples quadrangles. *New York State Museum Bulletin*, 63, Paleontology, 7:1–76.
Listed (p. 59) *Echinocaris?* [=“*Ceratiocaris*”] *longicauda* Hall as occurring in the Genundewa Limestone of the Genesee [Group] and (p. 61) *Eleutherocaris whitfieldi* Clarke and *Stylonurus?* [=“*Dunsopterus*”] *wrightianus* (Dawson) as occurring in the Naples fauna of the Cashaqua Shale of the Portage [Sonyea Group].
- Clarke, J. M., and R. Ruedemann. 1903. Catalogue of type specimens of Paleozoic fossils in New York State Museum. *New York State Museum Bulletin*, 65, Paleontology, 8:1–847.
Listed museum numbers, rock units, localities, and other data for type specimens (including hypotypes and plastotypes) of *Echinocaris condylepis* Hall and Clarke (p. 700–701), *E. multinodosa* Whitfield (p. 701), *E. punctata* (Hall) (p. 701–703), *E. pustulosa*

- Whitfield (p. 704), *E. socialis* Beecher (p. 704), and *E. sublaevis* Whitfield [= *E. sublevis*] (p. 704), as well as *Eleutherocaris whitfieldi* Clarke (p. 705), *Ceratiocaris* [= "*Ceratiocaris*"] *longicauda* Hall (p. 668) and *Stylonurus* (?) [= ? *Dunsophterus*] *wrightianus* (Dawson) (p. 761).
- . 1912. The Eurypterida of New York. *New York State Museum Memoir* 14:1–439.
Discussed (p. 311–312), provided a synonymy for (p. 311) and illustrated (text fig. 68) the type and sole specimen of *Stylonurus* (?) [= ? *Dunsophterus*] *wrightianus* (Dawson) (= *Echinocaris wrightianus*), and concurred with Beecher, 1900, that the specimen represented the crawling legs of a form related to *Stylonurus*. [See also Dawson, 1881b, and Waterston, 1968.]
- Claypole, E. W. 1903. The Devonian Era in the Ohio basin. Part II, Devonian palaeontology of the Appalachian Gulf. *American Geologist* 32:240–250.
Listed (p. 249), after Newberry, 1873, *Ceratiocaris*? and *Ceratiocaris* sp. [not *Ceratiocaris*, but at least in part *Echinocaris*; see Newberry, 1873] as occurring in the Erie [= Chagrin] Shale of Ohio.
- Cleavelly, R. J. 1983. *World Palaeontological Collections*. British Museum (Natural History) and Mansell Publishing, London, 365 p.
Noted (p. 52) that C. E. Beecher donated specimens of *Echinocaris* [including a metatype of *E. socialis*], and *Tropidocaris* to the British Museum (Natural History) and (p. 225) that the North Devon Athenaeum has material of E. M. Partridge, including *Echinocaris whidbornei*. [See also Butler, 1980.]
- Cleland, H. F. 1903. A study of the fauna of the Hamilton Formation of the Cayuga Lake section in central New York. *U.S. Geological Survey Bulletin* 206:1–112.
Reported (p. 81) specimens of *Echinocaris punctata* (Hall) in the Upper and Lower Hamilton in the Cayuga Lake section. Listed (p. 104) *E. punctata* as occurring, very rarely, in the *Michelinia* zone, first *Cypricardella-Athyris* zone, and second *Cypricardella-Athyris* zone of the Lower Hamilton, and in the *Cystodictya* zone of the Upper Hamilton of the section.
- . 1911. The fossils and stratigraphy of the Middle Devonian of Wisconsin. *Wisconsin Geological and Natural History Survey Bulletin*, Scientific Series No. 6, 21:1–222.
Described (p. 145–146), after Hall [and Clarke], and illustrated (Pl. XLIV, fig. 3) a specimen of *Echinocaris punctata* (Hall) from Middle Devonian rocks of the Milwaukee cement quarry, Berthelet, Wisconsin. Also described (p. 146) and illustrated (Pl. XLIV, fig. 4) a specimen consisting of an abdomen and telson that, "differs from those of New York *E. punctata* . . . and may be a new . . . species." [Both specimens are now in the United States National Museum of Natural History, USNM 78216. See also Monroe and Teller, 1899.]
- Coogan, A. H., L. E. Babcock, J. T. Hannibal, D. W. Martin, K. S. Taylor, and D. C. Wehn. 1986. *Late Devonian and Early Mississippian strata at Stebbins Gulch, Geauga County, and Quarry Rock, Cuyahoga County, Ohio*. Field Trip Guidebook, Field Trip Number 1, Geological Society of America Northcentral Section Meeting, Kent, Ohio, 16 p.
Noted (p. 4) that the Chagrin Shale, at some localities particularly to the east of Stebbins Gulch, contains a fauna with *Echinocaris*, brachiopods, gastropods, bivalves, nautiloids, and other taxa.
- Copeland, M. J. 1960a. The occurrence of *Echinocaris* and *Spathiocaris* (Phyllocarida) in western Canada. In Canadian fossil Arthropoda, Eurypterida, Phyllocarida and Decapoda, edited by M. J. Copeland and T. E. Bolton. *Geological Survey of Canada Bulletin* 60:1–11.
Described *Echinocaris castorensis* n. sp. (p. 4, fig. 1, Pl. I, nos. 1–5) from the Upper Devonian Alexo Formation, "Beaver Ridge," Alberta, comparing it to *E. auricula* Eller; *E. consanguina* Eller (p. 5–6, Pl. I, nos. 6, 6a) from the same unit and locality, comparing it to *E. condylepis* Hall and Clarke; *E. sp.* (telson) (p. 6, Pl. I, no. 7) from the Upper Devonian Duvernay Formation, Alberta; and *E. beecheri* n. sp. [not *E. beecheri* of Clarke (nomen nudum); see Clarke, 1891] (p. 6–7, fig. 2, Pl. I, no. 8) from the Mississippian Banff? Formation, Alberta, comparing it to *E. whidbornei* Jones and Woodward and *E. randalli* Beecher [= *E. randalli*]. Also discussed the stratigraphic position of these species (p. 2) and listed (p. 3) previously described species of *Echinocaris*, including "*E.*" [= ? *Dunsophterus*] *wrightiana* (Dawson) (= *Stylonurus* ? *wrightianus*) from North America.
- . 1960b. New occurrences of *Ceratiocaris* and *Ptychocaris* (Phyllocarida) from the Canadian Arctic. In Canadian fossil Arthropoda, Eurypterida, Phyllocarida and Decapoda, edited by M. J. Copeland and T. E. Bolton. *Geological Survey of Canada Bulletin* 60:49–54.
Diagnosed (p. 51) the Echinocaridae (sic) and presented a key to the genera in the family: *Echinocaris*, *Silesicaris*, *Eleutherocaris* and *Ptychocaris*. Listed (p. 52) *Echinocaris* sp. McLaren (then a manuscript name) in the synonymy for *Ptychocaris novaki* n. sp. [See McLaren 1963.]
- Copeland, M. J., and T. E. Bolton. 1985. Fossils of Ontario. Part 3: The eurypterids and phyllocarids. *Royal Ontario Museum Life Sciences Miscellaneous Publications*: 1–48.
Noted (p. 39) and illustrated (fig. 25) the occurrence of *Echinocaris* sp. [*E. cf. E. punctata*], collected from the Middle Devonian, Arkona Formation, Hamilton Group, at Hungry Hollow, Ontario. Also mentioned

- (p. 39) that *Echinocaris pustulosus* (Hall) is "the typical Middle Devonian representative of the genus in New York State." [*E. pustulosa* Whitfield is a Late Devonian form; *E. punctata* (Hall) is the typical Middle Devonian form.]
- Dacqué, E. 1921. *Vergleichende biologische Formenkunde der fossilen niederen Tiere*. Gebrüder Borntraeger, Berlin, 777 p. (Reprinted, 1980, by Arno Press, New York)
- Discussed (p. 289) Paleozoic phyllocarids, illustrating (fig. 113) *Echinocaris* [*punctata* (Hall)], from [after] Zittel, 1915 [which is, in turn, modified from Beecher, 1884]. [The figure is reversed.]
- Dana, J. D. 1895. *Manual of Geology*, Fourth Edition. American Book Company, New York, 1087 p.
- Mentioned (p. 614–615) that there are a number of species of *Echinocaris* in Portage rocks and noted the occurrence of *Echinocaris* [= *Eleutherocaris*] *whitfieldi* Clarke and *E.?* *beecheri* Clarke [nomen nudum; see Clarke, 1891] in the Portage Naples beds (p. 620–621, after Clarke 1891, 1892) and the occurrence of *E. socialis* Beecher in the Chemung beds of New York and Pennsylvania (p. 621). Illustrated *E. punctata* (Hall) (fig. 920), [modified from] Beecher [1884].
- Dawson, J. W. 1881a. On new Erian (Devonian) plants (abstract). *Canadian Naturalist*, New Series, 9:475–476.
- Briefly described (p. 476) a new fern, *Equisetites wrightianus* n. sp., from New York. [See also Dawson, 1881b.]
- . 1881b. Notes on new Erian (Devonian) plants. *Geological Society of London Quarterly Journal* 37: 299–308.
- Described (p. 301, Pl. XII, fig. 10; Pl. XIII, fig. 20) a new species of fern, *Equisetides wrightiana* [= *Dunsophterus wrightianus* (Dawson)], from the Portage Group at Italy, New York. [Several names have been applied to this enigmatic species. Dawson himself referred the species to both *Equisetites* and *Equisetides* in 1881. This taxon was subsequently considered referable to *Echinocaris*, later, to the Eurypterida, and, most recently, questionably to the genus *Dunsophterus*: see Waterston, 1968. We have not been able to locate the holotype of this enigmatic fossil, but casts of the original, and sole, specimen of the taxon are in at least two museums, the British Museum (Natural History) and the New York State Museum. A copy of correspondence between J. Hall and H. Woodward on the specimen is also deposited in the British Museum. One eurypterid specialist, R. Plotnick (personal communication) doubts that this specimen really is a portion of an eurypterid. Based upon the asymmetry of the specimen, as seen in the illustrations, and our examination of the material at the British Museum, it could even be a trace fossil.]
- . 1882. The fossil plants of the Erian (Devonian) and upper Silurian formations of Canada. Part 2. *Geological Survey of Canada Report*: 93–142. [Report 429 in Ferrier's catalogue.]
- Noted (p. 126) Wright's discovery of *Equisetites wrightiana* Dawson [= *Dunsophterus wrightianus* (Dawson)]; see Dawson, 1881b.]
- Derby, A. G. 1906. A bibliography of Ohio geology. Part 1. A subject index of the publication of the Geological Survey of Ohio. . . . *Geological Survey of Ohio, Fourth Series, Bulletin* 6:1–233.
- Indexed (p. 179) descriptions of *Echinocaris* in Whitfield, 1893.
- Duluk, C. E. 1964. Fossil fauna of the Silica Formation. *Earth Science* 17(6):250–255. Reprinted in *Fossils of the Mid-continent of North America*, 1965, p. 37–42. Earth Science Publishing Co., Downers Grove, Illinois.
- Reported *Echinocaris* (p. 40) and "jaws" variously identified as fish and mandibles of crustaceans, "particularly *Echinocaris*" (p. 40–41, fig. 15b), from Middle Devonian rocks exposed in the Medusa Portland Cement Quarries in Sylvania, Ohio [see Dunkle, 1965; Rolfe, 1966; and Stumm and Chilman, 1969, for further discussion of the identification of the mandibles].
- Dunkle, D. H. 1965. The presumed holocephalan fish *Pseudodontichthys whitei* Skeels. *Scientific Publications of the Cleveland Museum of Natural History*, New Series, 4(2):1–10.
- Discussed (p. 3–5) and illustrated (figs. 1 and 2; Pl. 1) mouth parts, previously identified as representing a holocephalan fish, from the Silica Shale of Ohio. Observed that these mouth parts closely resembled those occurring with *Echinocaris punctata* as noted by Beecher (1884) and Hall and Clarke (1888). [See also Rolfe and Denison, 1966.]
- Dzik, J. 1980. Isolated mandibles of Early Palaeozoic phyllocarid Crustacea. *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte* 1980(2):87–106.
- Observed (p. 97) that the mandibles of *Montecaris?* sp. from the Devonian of Poland had a gnathal lobe like that of *Echinocaris*, but with different tooth morphology. Also concluded (p. 101–102) that, "archaeostracans were feeding on relatively firm food, which did not need cutting into pieces. but trituration [sic]," consistent with a postulated habitat close to the sea bottom.
- Eastman, C. R. 1913. See Zittel 1900.
- Easton, W. H. 1960. *Invertebrate Paleontology*. Harper and Brothers, New York, 701 p.
- Noted (p. 563) *Echinocaris* to be a characteristic Paleozoic genus of phyllocarid. Illustrated (fig. 13.12.8) *E. socialis* Beecher, after [modified from] Hall and Clarke, 1888.

- Edmonds, E. A., B. J. Williams, and R. T. Taylor. 1979. Geology of Bideford and Lundy Island. *Geological Survey of Great Britain. Memoir for 1:50 000 geological sheet 292, New Series, with sheets 275, 276, 291 and part of sheet 308*, 143 p.
- Reported (p. 20) *Echinocaris slioiensis* Partridge and *E. whidbornei* Jones and Woodward from the shaly sequence of the coastal sections of the Upper Devonian Baggy Sandstones (after Goldring, 1971) and (p. 21) *E. sp.* and *E. whidbornei* (Pl. 2, fig. 10) from the inland sections of the Baggy Sandstones in a quarry near Croyde Hoe, Georgeham, England.
- Eller, E. R. 1935. New species of *Echinocaris* from the Upper Devonian, of Alfred Station, New York. *Annals of the Carnegie Museum* 24:263–274.
- Described *Echinocaris consanguina* n. sp., (p. 268–269, Pl. III, figs. 1–4), *E. turgida* n. sp., (p. 269–270, Pl. III, figs. 5, 6) and *E. auricula* n. sp., (p. 271, Pl. III, fig. 7) from the Upper Devonian [Famennian?] Alfred Shale [Canadaway Group] exposed at Alfred Station, New York. The species are compared with each other and with *E. punctata* (Hall), *E. condylepis* Hall and Clarke, *E. socialis* Beecher (also incorrectly spelled *E. sociales*) and *E. sublaevis* Whitfield [= *E. sublevis*]. Eller also discussed (p. 264–267) several aspects of the morphology of *Echinocaris* finding no evidence of an eye on the “eye node” and doubting the existence of a “nuchal furrow” separating the cephalic and thoracic regions.
- . 1937. *Echinocaris crosbyensis*, a new species from the Upper Devonian of New York. *Annals of the Carnegie Museum* 25:257–259.
- Described (p. 257–258) and illustrated (fig. 1) *Echinocaris crosbyensis* n. sp. from near Crosby Creek, New York, “possibly from the same horizon” as species previously described (Eller, 1935) from the Alfred Shale, and compared it with *E. whidbornei* Jones and Woodward, *E. condylepis* Hall and Clarke, *E. socialis* Beecher, and *E. turgida* Eller.
- Etheridge, R., H. Woodward, and T. R. Jones. 1884. Report of the committee . . . on the fossil Phyllopora of the Palaeozoic rocks. *Report of the fifty-third meeting of the British Association for the Advancement of Science held at Southport in September, 1883*:215–223.
- Listed (p. 217) *Echinocaris* as a leperditioiid phyllopod [sic] with four spiny exposed abdominal segments and three telson styles or caudal spines.
- . 1886. Third Report of the committee . . . on the fossil Phyllopora of the Palaeozoic rocks. *Report of the fifty-fifth meeting of the British Association for the Advancement of Science held at Aberdeen in September, 1885*:326–361.
- Abstracted and commented on (p. 358–361) references to species of *Echinocaris*, and taxa at one time referred to that genus, in Hall, 1863; Whitfield, 1880; Dawson, 1881; Beecher, 1884; and Jones and Woodward, 1884.
- . 1889. Sixth report of the committee . . . on the fossil Phyllopora of the Palaeozoic rocks. *Report of the fifty-eighth meeting of the British Association for the Advancement of Science held at Bath in September, 1888*:173–181.
- Abstracted and commented on references to *Echinocaris*, and taxa at one time referred to that genus, in Clarke, 1885 (p. 175) and Hall and Clarke, 1888 (p. 180). Noted (p. 180) that Hall preferred the name *E. punctata* (Hall) over *E. armata* (Hall).
- . 1891a. Seventh report of the committee . . . on the fossil Phyllopora of the Palaeozoic rocks. *Report of the sixtieth meeting of the British Association for the Advancement of Science held at Leeds in September, 1890*:63–68. [A reprint of this article indicates that this paper was read at the Newcastle-upon-Tyne meeting.]
- Briefly commented (p. 63–64) on a newly discovered specimen of *Echinocaris* found in a quarry near Soly, England. [This specimen was the basis for the description of *E. whidbornei* Jones and Woodward, see Jones and Woodward, 1889.]
- . 1891b. Eighth report of the committee . . . on the fossil Phyllopora of the Palaeozoic rocks. *Report of the sixtieth meeting of the British Association for the Advancement of Science held at Leeds in September, 1890*:424–428.
- Noted (p. 426) the presence of *Echinocaris* in Devon and in the Devonian strata of North America.
- Feldmann, R. M., R. M. Boswell, and T. W. Kammer. 1986. *Tropidocaris salsiusculus*, a new rhinocaridid (Crustacea: Phyllocarida) from the Upper Devonian Hampshire Formation of West Virginia. *Journal of Paleontology* 60(2):379–383.
- Noted (p. 379) references to *Echinocaris* sp. (Williams and Kindle, 1905) and *Echinocaris auricula* Eller (Hannibal and Feldmann, 1985) as the only records of the genus in West Virginia.
- Feldmann, R. M., and J. T. Hannibal. 1985a. Fingerprinting fossils. *Earth Science* 38(1):14–15.
- Commented on the biological relationships of *Echinocaris*, as presented by Rolfe, 1981. Illustrated a specimen of *E. punctata* (Hall) (p. 15), after Hall and Clarke, 1888, and included a map (p. 15) showing some locations in North America and England where echinocaridids [specifically *Echinocaris*] have been found.
- . 1985b. Paleobiogeography of *Echinocaris*. *Geological Society of America Abstracts with Programs* 17(5):287.
- Reviewed the paleobiogeography of *Echinocaris* and reported a new West Virginia locality [see Hannibal

- and Feldmann, 1985] for *Echinocaris*. Questioned certain finds of echinocaridid "cercopods" [see Feldmann, Hannibal and Babcock, 1986 and Allan, 1935, herein] and found the genus "to be a good index in Middle and Late Devonian fine clastic rocks deposited in tropical and subtropical marine habitats lacking in shelly faunal elements."
- Feldmann, R. M., J. T. Hannibal, and L. E. Babcock. 1986. Fossil worms from the Devonian of North America (*Sphenothallus*) and Burma ("Vermes") previously identified as phyllocarid arthropods. *Journal of Paleontology* 60(2):341-346.
Illustrated (fig. 3), and redescribed as "Vermes" (p. 343-345), fossils previously identified as "cercopods" of *Echinocaris asiatica* Reed [see Reed, 1908] from the Wetwin shales of Burma. [*E. asiatica* is incorrectly spelled *E. asiaticus* in the abstract of this paper.]
- Feldmann, R. M., and S. McKenzie. 1981. *Echinocaris multispinosis*, a new echinocarid (Phyllocarida) from the Chagrin Formation (Late Devonian) of Ohio. *Journal of Paleontology* 55(2):383-388.
Described *Echinocaris multispinosis* n. sp. (p. 385-386; text fig. 2) based on a single specimen from the Chagrin Shale (Famennian) at Indian Point, Lake County, Ohio. Noted (p. 386) that the type locality of the new species, "may well be the type locality of the species described by Whitfield (1880)." [See Whitfield, 1880.] Found that arthropods, predominantly *Echinocaris*, comprised 50% of the fauna found in a sample of concretions at this locality. Provided a key to the identification of arthropods, including *E. pulchra* Sturgeon, Hlavin and Kesling [= *E. pulchra*], *E. ohioensis* Sturgeon, Hlavin and Kesling, *E. sublaevis* Whitfield [= *E. sublevis*], and *E. multinodosa* Whitfield from the Chagrin and suggested that *E. sublaevis* and *E. ohioensis* are quite similar. Also discussed the paleoecology of *Echinocaris* and provided (text fig. 1, modified from Sturgeon, Hlavin and Kesling, 1964) an illustration of a generalized *Echinocaris*.
- Feldmann, R. M., R. G. Osgood, Jr., E. J. Szmuc, and D. W. Meinke. 1978. *Chagrinichnites brooksi*, a new trace fossil of arthropod origin. *Journal of Paleontology* 52(2):287-294.
Noted (p. 292) that *Echinocaris multinodosa* Whitfield, *E. sublevis* Whitfield, *E. pulchra* Sturgeon, Hlavin and Kesling, and *E. ohioensis* Sturgeon, Hlavin, and Kesling have been described from the Famennian age Chagrin Shale in northeastern Ohio but concluded (p. 292-293) that these, and other, archaostrotracans had morphology that would make it difficult to ascribe the traces from the Chagrin described as *Chagrinichnites brooksi* n. sp. to them.
- Fenton, C. L., and M. A. Fenton. 1958. *The Fossil Book*. Doubleday, Garden City, New York, 482 p.
Illustrated (p. 235) *Echinocaris punctata* (Hall) [modified from Beecher, 1884].
- Fisher, D. W. 1951. Marcasite fauna in the Ludlowville Formation of western New York. *Journal of Paleontology* 25:365-371.
Listed (Table 1) *Echinocaris* (?) sp. as occurring, rarely, in the marcasite horizon of the Ledyard Shale in western New York.
- Frey, R. W., H. A. Curran, and S. G. Pemberton. 1984. Tracemaking activities of crabs and their environmental significance: the ichnogenus *Psilonichnus*. *Journal of Paleontology* 58(2):333-350.
Listed (p. 333) *Chagrinichnites* as one of several ichnogenera of trace fossils of crustacean origin.
- Gekker, R. F. 1941. Deposits, fauna and flora of the main Devonian field. In *Fauna of the Main Devonian Field, I*, edited by R. F. Gekker, p. 17-84. USSR Academy of Sciences, Palaeontological Institute, Moscow.
Noted (p. 51) the occurrence of *Echinocaris* in the main Devonian field. Listed, in a faunal distribution list (p. 65), *Echinocaris tudrensis* Tschernyshev as occurring in the Bilova Series (Famennian) and *E. sp.* as occurring in the Pskov beds (Frasnian). [In Russian, with English summary. See also Tschernyshev, 1941.]
- _____. 1983. Tafonomicheskiye i ekologicheskiye osobennosti fauny i flory glavnogo Devonskogo polya [Taphonomic and ecological characteristics of the fauna and flora of the main Devonian Field]. *Akademiya Nauk SSSR. Trudy Paleontologicheskogo Instituta* 190:1-144.
Summarized (p. 75, after Tschernyshev, 1941) information on *Echinocaris* from the main Devonian field of the Russian Platform, contrasting the paucity of specimens with the greater number of specimens of the genus found in the Devonian sediments of the Urals. Mentioned *E. tudrensis* Tschernyshev. [In Russian.]
- Goldring, R. 1971. Shallow-water sedimentation as illustrated in the Upper Devonian Baggy Beds. *Memoirs of the Geological Society of London*, 5:1-80.
Reported (p. 9) that *Echinocaris* sp. has been found in the *Diplocraterion yoyo* facies near Croyde Hoe, England and (p. 32) that *E. sloliensis* Coomaraswamy [sic] [the author of the species is actually Partridge] and *E. whidbornei* Jones and Woodward have been associated with lingulids (p. 31) in the *Lingula* facies of the Baggy beds (Famennian). Speculated on the environment in which *Echinocaris* lived, noting that *Echinocaris* "seems to be very much a facies fossil" (p. 32), and mentioned Partridge's description of a species of *Echinocaris* (p. 2).
- _____. 1978. Devonian. In *The Ecology of Fossils*, edited

- by W. S. McKerrow, p. 125–145. MIT Press, Cambridge.
- Illustrated (fig. 36) *Echinocaris* [with a somewhat disproportionately small carapace] in a reconstruction of the sedimentary environment in which portions of the Upper Devonian Baggy Formation of North Devon, England, were deposited. Suggested (p. 140) *Echinocaris* to be associated with *Lingula* in the bay and coastal lagoon facies. One of the echinocaridids is shown (fig. 36) inside the burrow *Diplocraterion*. Suggested that *Echinocaris* was probably epifaunal, based on the morphology of the carapace.
- Goldring, R., and F. Langenstrassen. 1979. Open shelf and near-shore clastic facies in the Devonian. *Special Papers in Palaeontology* 23:81–97.
- Reported (p. 89) phosphatized carapaces of *Echinocaris* to be common in the *Lingula* facies of the Baggy Sandstones (Famennian) of North Devon, England.
- Goldring, R., I. P. Tunbridge, A. Whittaker, et al. 1978. North Devon. In *A Field Guide to Selected Areas of the Devonian of Southwest England*, edited by C. T. Scrutton, p. 8–27. Palaeontological Association, London.
- Specimens of *Echinocaris*, as phosphatised internal molds, were reported (p. 23) to occur with *Lingula* and *Diplocraterion* in a sequence of interbedded shales and sandstones within the Famennian age Baggy Sandstones at Path Cove, near Baggy Point, England.
- Goldring, W. 1929. Handbook of Paleontology for Beginners and Amateurs. Part 1. The Fossils. *New York State Museum Handbook* 9:1–356.
- Noted (p. 203) *Echinocaris* on exhibit in the New York State Museum, Albany, and illustrated (fig. 56B) *E. punctata* (Hall), after [modified from] Beecher, 1884 [the illustration is reversed].
- Grabau, A. W. 1921. *A Textbook of Geology. Part II: Historical Geology*. D. C. Heath and Co., Boston, 976 p.
- In a discussion of the Devonian (p. 424) noted that, “the fresh water (river and estuarine) deposits are characterized by the remains of crustaceans (fig. 1336) and eurypterids.” Illustrated (Fig. 1336b) *Echinocaris punctata* (Hall) [modified from Beecher, 1884] from the Hamilton. [The illustration is reversed.]
- Grabau, A. W., and H. W. Shimer. 1910. *North American Index Fossils: Invertebrates*. Vol. II. A. G. Seiler and Company, New York, 909 p.
- Diagnosed *Echinocaris* (p. 376), noting that it had a free rostrum and no posterolateral spines [no rostrum is known; most of the values of *E. clarkei* [= *E. clarkii*] Beecher, including their posterolateral portions, are surrounded by spinose ornamentation] and *Eleutherocaris* (p. 380). Briefly described: *E. punctata* (Hall) (p. 376, fig. 1678) after [modified from] Beecher, [1884] [the figure is reversed]; *E. socialis* Beecher (p. 376–377, fig. 1679, after [modified from] Beecher, [1902]); *E. sublaevis* Whitfield [= *E. sublevis*] (p. 377, fig. 1680a&b) [modified from Whitfield, 1890]; *E. pustulosa* Whitfield (p. 378, fig. 1680c) [modified from Whitfield, 1890]; and *E. multinodosa* Whitfield (p. 378, fig. 1680d) modified from Whitfield, 1890]. Diagnosed *Eleutherocaris* and briefly described *Eleutherocaris whitfieldi* Clarke (p. 380). These species were also assigned (p. 686) to faunal provinces.
- Grasso, T. X. 1981. Stratigraphy, paleontology and paleoecology of the Upper Hamilton Group (Middle Devonian), in the Genesee Valley, Livingston County. In *Guidebook to Field Trips, Annual Spring Meeting—National Association of Geology Teachers—Eastern Section, June 5–7, 1981*, edited by R. M. Liebe, p. B1–B36.
- Reported the presence of *Echinocaris* in the Kashong Shale Member of the Moscow Formation exposed at Little Beards Creek (Stop #4, p. B–36) near Leicester, New York. Brachiopods, bivalves, bryozoans, crinoids, trilobites and *Echinocaris* are listed (p. B–8) as occurring in the Kashong fauna. The *Tropidoleptus*—bivalve community, in which *Echinocaris* occurs, is described (p. B–16) as inhabiting, “soft substrates in shallow water of low energy, reminiscent of the Ledyard but containing higher levels of dissolved oxygen.” Also illustrated (fig. B–13) *Echinocaris punctata* [after Beecher, 1884].
- Gürich, G. 1929. *Silesicaris* von Leipe und die Phyllokariden überhaupt. *Mitteilungen aus dem mineralogisch-geologischen Staatsinstitut in Hamburg* 11:21–90.
- Described (p. 76–78) *Echinocaris*, commenting on the following Devonian species: *E. whidbornei* Jones and Woodward, *E. punctata* (Hall), *E. socialis* Beecher, *E. sublaevis* Whitfield [= *E. sublevis*], *E. condylepis* Hall and Clarke, *E. pustulosa* Whitfield and *E. multinodosa* Whitfield. Distinguished *Echinocaris* from *Ceratiocaris* and *Aristozoe*. Noted (p. 82) that *Pephricaris horripilata* may belong to the genus *Echinocaris*. Found (p. 82) *Ceratiocaris* [= “*Ceratiocaris*”] *longicauda* Hall to be problematical. Redescribed (p. 86) and commented on the Lower Carboniferous *E. clarkei* [= *E. clarkii*] Beecher, finding the serrated margin of its carapace to be reminiscent of *Pephricaris*. Found (p. 86) the Lower Carboniferous *E. randallii* Beecher to be little distinguished from *E. socialis*. Also redescribed (p. 81–82) *Eleutherocaris whitfieldi* Clarke, distinguishing the genus *Eleutherocaris* from *Echinocaris*. Illustrated *E. punctata* (Text plate 7, fig. 4) [modified from Hall and Clarke, 1888], *E. socialis* (Text plate 8, fig. 1) [modified from Beecher, 1902], *E. sublaevis* [= *E. sublevis*] (Text plate 8, fig. 2) [modified from Hall and Clarke,

- 1888?], *E. condylepis* (Text plate 8, fig. 3) [modified from Hall and Clarke, 1888], *E. clarkei* (Text plate 9, fig. 7) [modified from Beecher, 1902] and *Eleuthero-caris whitfieldi* (Text plate 8, fig. 10) [modified from Hall and Clarke, 1888].
- Hall, J. 1863. Contributions to palaeontology, no. 6, on the occurrence of crustacean remains of the genera *Ceratiocaris* and *Dithyrocaris*, with a notice of some new species from the Hamilton Group and Genesee Slate. *16th Report of the New York State Cabinet of Natural History*, Appendix D:71–75.
- Described *Ceratiocaris armatus* n. sp. (p. 72–73; Pl. I, figs. 1–3) [= *Echinocaris punctata* (Hall)] based on abdomen and telson material from the shales of the Hamilton Group, in Ontario County, New York and *Ceratiocaris? punctatus* n. sp. (p. 74; Pl. I, fig. 8) [= *E. punctata* (Hall)] based on the left half of a carapace from the shales of the Hamilton Group on the east shore of Cayuga Lake. [Although *E. armatus* should have had priority over its synonym *C. [=E.] punctata*, most subsequent authors, with a few exceptions, including Jones and Woodward, 1884, have used the name *E. punctata* to refer to this species. As most authors, we refer to this species as *Echinocaris punctata*.] Also described (p. 73, Pl. I, fig. 4–7) *Ceratiocaris longicauda* n. sp. [= "*Ceratiocaris*" *longicauda*. This taxon has been referred to as *Echinocaris longicauda* in Beecher, 1884, and Miller, 1889, and listed under *Echinocaris* in Clarke, 1892. Hall and Clarke (1882) and Clarke (1892) noted that the specimens illustrated as fig. 4–6 were other than arthropods.]
- _____. 1876. Illustrations of Devonian fossils: Gastropoda, Pteropoda, Cephalopoda, Crustacea and corals of the Upper Helderberg, Hamilton, and Chemung groups. *New York Geological Survey, Palaeontology*: 39 pls.
- Illustrated [after Hall, 1863] an abdomen and telson referred to as *Ceratiocaris armatus* Hall [= *Echinocaris punctata* (Hall)] (Pl. XXIII, figs. 4–5) and a carapace referred to as *Ceratiocaris (Aristozoe) punctatus* [= *E. punctata*] (Pl. XXIII, fig. 7). Noted (note accompanying Pl. XXIII) that, "as this sheet is going to press" a specimen was found with a carapace like that of *C. punctatus* and an abdomen like that of *C. armatus*.
- _____. 1884. [Note accompanying Pl. XV] *Thirty-fifth Annual Report on the New York State Museum of Natural History* 35:Pl. XV.
- Remarked on *Equisetides wrightiana* Dawson [= *Dunsopterus wrightianus*], referring to it as a form not unlike *Stylonurus*. [See also Wright, 1884, and Dawson, 1881b.]
- Hall, J., and J. M. Clarke. 1888. Trilobites and other Crustacea of the Oriskany, Upper Helderberg, Hamilton, Portage, Chemung and Catskill groups. *New York State Geological Survey, Palaeontology* 7:i–lxiv, 1–236.
- Provided (p. liii) a synonymy for the genus *Echinocaris*. Diagnosed (p. liv) *Echinocaris* and compared the genus (p. liv–lv) to *Aristozoe* and *Ptychocaris*. Included (p. liv) a sketch of an *Echinocaris* [*E. punctata*, modified from Beecher, 1884]. Described *E. condylepis* n. sp. from greenish shales of the Chemung Group, Belmont (p. 173–174; Pl. XXIX, figs. 14–17). Provided synonymies and described: *Echinocaris punctata* (Hall) from the Hamilton Group of New York State (including mandibles of Phyllocarida found associated with *E. punctata*) (p. 166–171, Pl. XXVII, fig. 10; Pl. XXVIII, figs. 1–7 [figs. 6 and 7 modified from Hall, 1863, figs. 3 and 5 modified from Beecher, 1884], Pl. XXIX, figs. 1–8 [figs. 1–2 modified from Beecher, 1884]); *Echinocaris* [= *Eleuthero-caris*] *whitfieldi* Clarke from the lower beds of the Portage ("Naples beds" of Clarke), Hatch Hill, Naples, New York (p. 172–173; Pl. XXIX, figs. 20–21) [note the difference between fig. 21 and fig. 4 in Clarke, 1885; see also Rolfe, 1969, fig. 142.4b]; *E. socialis* Beecher from the base of the Chemung Group as exposed at Warren, Pennsylvania (p. 174–176; Pl. XXX, figs. 1–12) [figs. 1–6, 8–9, 11–12 modified from Beecher, 1884]; *E. sublaevis* Whitfield [= *E. sublevis*] from the Erie Shales [= Chagrin Shale] at LeRoy, Ohio (p. 176–178; Pl. XXIX, figs. 11–13); *E. pustulosa* Whitfield from the Erie Shales at LeRoy (p. 178–179; Pl. XXIX, figs. 9–10); and *E. multinodeosa* Whitfield from the Erie Shales at LeRoy (p. 180–181; Pl. XXIX, figs. 18–19). Noted (p. 174) that *E. condylepis* is "almost a miniature of *E. punctata*." Provided (p. 160) a synonymy for and described (p. 160–162; Pl. XXVII, figs. 7–9), as a possible stytonurid, the sole specimen of *Stylonurus* (?) (*Echinocaris*?) [= *Dunsopterus*] *wrightianus* (Dawson). Also provided synonymies and described *Ceratiocaris* [= "*Ceratiocaris*"] *longicauda* Hall (p. 163–4, Pl. XXXI, fig. 1), noting that some specimens originally referred to the taxa were, in fact, specimens of *Coleolus aciculum* Hall. [Many of the illustrations in this volume are similar to illustrations that have appeared previously in the literature, but were likely redrawn from original specimens or casts.]
- Hannibal, J. T., and R. M. Feldmann. 1981. Arthropod trace fossils, interpreted as echinocarid escape burrows, from the Chagrin Formation (Late Devonian) of Ohio. *Geological Society of America Abstracts with Programs* 13(7):467.
- [See Hannibal and Feldmann, 1983.]
- _____. 1983. Arthropod trace fossils, interpreted as echinocarid escape burrows, from the Chagrin Shale (Late Devonian) of Ohio. *Journal of Paleontology* 57(4):705–716.

- Discussed (p. 713–714) the possible relationships of *Echinocaris* to the trace fossil *Chagrinihnites osgoodi* n. sp., concluding (p. 713) that, “it is most probable that the trace maker . . . was one or more species of *Echinocaris*.” Illustrated (fig. 7) a generalized *Echinocaris* associated with such a trace and (fig. 8) an *Echinocaris* with an exploded block diagram of the trace. [The trace had been described previously by Lesquereux, 1891.]
- . 1985. A phyllocarid crustacean, *Echinocaris auricula*, from the Late Devonian of West Virginia. *Kirtlandia* 41:22–26.
- Redescribed (p. 23–25) *Echinocaris auricula* Eller based on the holotype and an additional specimen from Upper Devonian Chemung rocks in Preston County, West Virginia. Discussed variation in the species and compared *E. auricula* to *E. castorensis* Copeland and other species. Illustrated the holotype (fig. 2A), its counterpart (fig. 2B), and the West Virginia specimen (fig. 2C).
- . 1986. Late Devonian Crustacea, *Palaeopalaemon newberryi* and *Concavicularis* sp., from the Chagrin Shale of northeastern Ohio and Alfred Shale of western New York state. *Geological Society of America Abstracts with Programs* 18(4):291.
- Noted that the Chagrin Shale of Ohio and the Alfred Shale of New York contained a fauna of arthropods dominated by *Echinocaris*.
- Hecker. See Gekker.
- Herries, R. S. 1896. Long excursion of West Somerset and North Devon. *Proceedings of the Geologist's Association* 14(10):433–440.
- Reported (p. 440) the collecting of part and counterpart of a “fine specimen” of *Echinocaris whidbornei* Jones and Woodward “with an impression of another on the same slab” from the Baggy beds in Sloy Quarry, Georgeham, England. [See Jones and Woodward, 1899, p. 394 for a brief description of this specimen.]
- Hlavin, W. J. 1976. *Biostratigraphy of the Late Devonian black shales on the cratonal margin of the Appalachian Geosyncline*. Unpublished Ph.D. diss., Boston University, 194 p.
- Listed (Table 3) the occurrence of “indet. phyllocarid” and cf. *Echinocaris* sp. in the upper five feet of the Cleveland Shale on Townes Creek, Lorain Co., Ohio. [The specimens studied by Hlavin and deposited in the Cleveland Museum of Natural History, however, do not appear to include any *Echinocaris*.]
- Hoover, K. V. 1960. Devonian-Mississippian shale sequence in Ohio. *Ohio Department of Natural Resources, Geological Survey Information Circular Number 27:1–154*.
- Listed the occurrence (Appendix, p. 144) of *Echinocaris multinodosa* Whitfield, *E. pustulosa* Whitfield and *E. sublevis* Whitfield in the Upper Devonian Chagrin Shale of Ohio.
- Jones, T. R. 1883. II—Palaeozoic phyllopoda; as reported on to the British Association, Southport, 1883, Section C. Geology. *Geological Magazine*, Decade 2, 10:461–463.
- Listed (p. 463) *Echinocaris* as being leperditoid and as having four spiny exposed abdominal segments and three telson elements.
- . 1898a. The fossil Phyllopoda of the Palaeozoic rocks. Thirteenth report of the committee consisting of Prof. T. Wiltshire (Chairman), Dr. H. Woodward, and Prof. T. Rupert Jones (Secretary). *Report of the sixty-seventh meeting of the British Association for the Advancement of Science held at Toronto in August, 1897*: 343–346.
- Noted (p. 345–346) Whidborne's (1896b) redescription of *Echinocaris whidbornei* Jones and Woodward and reported (p. 346) the discovery of two additional specimens of *Echinocaris* [= *E. whidbornei*, see Jones and Woodward, 1899] from the Sloy Mudstone.
- . 1898b. III—The fossil Phyllopoda of the Palaeozoic rocks. *Geological Magazine*, New Series, Decade 4, 5:41–45.
- Essentially a reprint of Jones, 1898a. The portion on *Echinocaris whidbornei* Jones and Woodward (p. 44–45) is identical.
- . 1900. Fossil Phyllopoda of the Palaeozoic rocks—fifteenth report of the committee . . . *Report of the sixty-ninth meeting of the British Association for the Advancement of Science held at Dover in September, 1899* 68:403–405.
- Noted (p. 405) that one of the specimens of *Echinocaris whidbornei* Jones and Woodward discussed in Jones, 1898a and 1898b, was figured and redescribed in Jones and Woodward, 1899.
- Jones, T. R. See also Etheridge, Woodward, and Jones.
- Jones, T. R., and H. Woodward. 1884. Notes on phyllopodiform crustaceans, referable to the genus *Echinocaris*, from the Palaeozoic rocks. *Geological Magazine*, New Series, Decade 3, 1:393–396, Pl. 13.
- Gave a history of the specimens referred to *Ceraticaris armatus* Hall [= *Echinocaris punctata* (Hall)] (p. 393, Pl. XII, fig. 2, after Hall [1863]) and its synonyms, noting that the trivial name *armatus* deserves priority [but see Hall, 1863]. Reviewed (p. 394) Whitfield, 1880, and illustrated, for the first time, *E. sublevis* Whitfield [= *E. sublevis*] (Pl. XIII, figs. 3–5) and *E. pustulosa* Whitfield (Pl. XIII, fig. 6) from a yet unpublished plate supplied by Whitfield. Recognized (p. 394) only three “well-determined” species of

- Echinocaris*: *E. armata* (Hall), *E. sublaevis* Whitfield, and *E. pustulosa* Whitfield. Redescribed (p. 395–396) the sole specimen of *Equisetides wrightiana* Dawson (Pl. XIII, fig. 1a–b; A and B on p. 395) as representing a portion of the abdomen of a large *Echinocaris*, *E. wrightiana* (Dawson) [= ?*Dunsop-terus wrightianus*]. [See Dawson, 1881b.]
- _____. 1888. *A Monograph of the British Palaeozoic Phyllopora (Phyllocarida, Packard)*. Part I. Ceratiocaridae. The Palaeontographical Society, London, 72 p. Noted (p. 3), in a table of genera of fossil Phyllocarida, that *Echinocaris* was leperditoid, with spinous segments, and had a pod-like, oculate, bivalved carapace.
- _____. 1889. I.—On some new Devonian fossils. *Geological Magazine*, New Series, Decade 3, 6:384–388. Described (p. 385–386) and illustrated (fig. 1) *Echinocaris whidbornei* n. sp., from the “lead-blue shales of the *Lingula squamiformis* beds in a quarry near Sloly, close to the three-milestone on the Barnstaple and Ilfracombe road.” The authors distinguished the specimen from *E. punctata* (Hall) (illustrated as fig. 2, after [modified from] Beecher [1884]) and other previously described species on the basis of the presence of two parallel ridges on the carapace of the species and other characters. [The holotype, H 419, is deposited in the Sedgwick Museum, Cambridge University. See also Whidborne, 1896b.]
- _____. 1899. II.—Contributions to fossil Crustacea. *Geological Magazine*, New Series, Decade 4, 6:388–395. Briefly described (p. 393–394, Pl. XV, fig. 6) specimens of *Echinocaris whidbornei* Jones and Woodward from the Sloly Quarry [near Barnstaple]. [See also Partridge, 1902.]
- Jux, U. 1960. *Montecaris lehmanni*, a new crustacean from the Rhenish Devonian and the problem of its systematic position. *Journal of Paleontology* 34(6):1129–1152. Noted (p. 1147) the fossil assemblage containing *Echinocaris socialis* Beecher, described in Hall and Clarke, 1888, in a discussion of phyllocarid living habits. Discussed (p. 1147–1148) various aspects of the carapace of *E. crosbyensis* Eller, suggesting that the “eye notches” of *Echinocaris* and other phyllocarids were “the original sites of eyes.” Also discussed (p. 1148) the mandibles of phyllocarids, including those of *Dithyrocaris* [that is, *Echinocaris*]. Illustrated *E. crosbyensis* (Text fig. 4B) after [modified from] Eller, 1937 [not 1935] and a specimen of *E. punctata* (Hall) (Text fig. 9F) after [modified from] Hall and Clarke, 1888.
- fossils of the Middle Devonian Silica Formation. *University of Michigan Museum of Paleontology Papers on Paleontology*, Number 8:1–408. Gave (p. 155) a short synonymy for *Echinocaris punctata* (Hall) and briefly described the species as found in the Middle Devonian Silica Formation. Noted that the species occurs at the Martin-Marietta Quarry (in Washtenaw County, Michigan), as well as Silica, Ohio. Illustrated specimens of *E. punctata* (Pl. 73, fig. 1; Pl. 93, fig. 5; Pl. 129, figs. 6–9) [some of which were previously illustrated by Stumm and Chilman, 1969] and provided a diagram of the species (p. 155, after Stumm and Chilman, 1969).
- Kjellesvig-Waering, E. N. 1961. Eurypterids of the Devonian Holland Quarry Shale of Ohio. *Fieldiana, Geology* 14(5):79–98. Listed (p. 81) *Stylonurus* (?) [= ?*Dunsop-terus*] *wrightianus* (Dawson) in a list of eurypterids from the Devonian of North America. [See Dawson 1881b.]
- _____. 1966. A revision of the families and genera of the Stylonuracea (Eurypterida). *Fieldiana, Geology* 14(9):169–197. Recognized the species *Stylonurus* ? [= ?*Dunsop-terus*] *wrightianus* (Dawson), as questionably belonging to the genus *Stylonurus* (p. 178). [See Dawson 1881b.]
- Krestovnikov, V. N. 1960. Nadotryad Phyllocarida Packard, 1879. In *Osnovy Paleontologii*, 8, Trilobitoobraznye i rakoobraznye, edited by N. E. Chernysheva, p. 425–429. Akademia Nauk USSR, Moscow. Diagnosed the Echinocaridae [sic] and *Echinocariss* (p. 426). Illustrated *E. punctata* (Hall) (fig. 1247) [modified from] Hall and Clarke, 1888 [which is, in turn, after Beecher, 1884]. Mentioned (p. 427) *Eleutherocaris* Clarke as a member of the family. [In Russian.]
- _____. 1961. Novye rakoobraznye fillokaridy Paleozoya Russkoi platformy, Urala, Timana i Donbassa. Akademia Nauk SSSR, *Trudy Geological Institute*, Vpy, 52:1–67. Reviewed the occurrences of, and summarized stratigraphic information on, Echinocaridae [sic], including *E. archae* [= *E. arschae*] Tschernyshev, *E. uralensis* Tschernyshev, *E. (?) brevicarinata* Tschernyshev, *E. tudrensis* Tschernyshev, and various *E. spp.* Tschernyshev, from the Upper Devonian deposits of the Ural Mountains and the northwestern region of the Russian Platform (p. 10, 33, Table 5). Noted the similarity of *Echinocaris* sp. from the bank of the Arsha to *E. randalii* Beecher [= *E. randallii*]. Provided maps (figs. 1, 3) showing the distribution of *Echinocaris* in the Soviet Union. Also provided a chart (folded, between p. 8 and 9) showing the distribution of *Echinocaris* (worldwide) as Middle Devonian through Lower Carboniferous. [In Russian.]
- Kesling, R. V., and R. B. Chilman. 1975. Strata and mega-

- La Touche, T. H. D. 1913. Geology of the northern Shan States. *Memoirs of the Geological Survey of India* 39(2):1–379.
Included *Echinocaris asiatica* Reed in a list of fauna from the Wetwin shales [in what is now Burma] (Table 9) and identified, as its nearest ally, *E. punctata* (Hall) from the Hamilton Group of North America.
- Lesley, J. P. 1889–1890. A dictionary of the fossils of Pennsylvania and neighboring states. *Second Pennsylvania Geological Survey Report P4*:1–1283.
Illustrated (p. 214) *Echinocaris punctata* (Hall) [modified from] Zittel after [modified from] Beecher [1884] [the illustration is reversed] (and upside down as noted by J. Hall in the Errata, p. xxi) and *Echinocaris* [= *Eleutherocaris*] *whitfieldi* Clarke [modified from] Clarke, 1885. *Echinocaris socialis* is listed (p. 214) with the note “see Appendix.” [We could not, however, locate a reference to this taxon in any appendix.]
- Lesquereux, L. 1891. Remarks on some fossil remains considered as peculiar kinds of marine plants. *Proceedings of the U.S. National Museum* 13:5–12.
Described (p. 9–11, Pl. 1, figs. 4–9), as a fossil plant, *Physophycos bilobatus* n. sp. from rocks of the Portage Group [Chagrin Shale] along Lake Erie, near Cleveland. [Later authors have overlooked this article and the name has been unused subsequently. Specimens have been redescribed as trace fossils under the generic name *Chagrinichnites*. A request to suppress the name *P. bilobatus* has been submitted to the International Commission on Zoological Nomenclature. Hannibal and Feldmann, 1983, interpreted one of these forms as having been produced by *Echinocaris*.]
- McLaren, D. J. 1955. Devonian formations in the Alberta Rocky Mountains between Bow and Athabasca rivers. *Geological Survey of Canada Bulletin* 35:1–59.
Reported (p. 47) well preserved carapaces of *Echinocaris* sp., along with *Aulopora*, *Schuchertella*, *Cyrtospirifer* and other taxa, from a limestone unit in Member B of the Upper Devonian Alexo Formation at Beaver Ridge, Alberta. [The *Echinocaris* material is described in Copeland, 1960a.]
- _____. 1963. Southwestern Ellesmere Island between Goose Fiord and Bjerne Peninsula. In *Geology of the North-Central Part of the Arctic Archipelago, Northwest Territories (Operation Franklin)*, by Y. O. Fortier et al. *Geological Survey of Canada Memoir* 320: 310–338.
Reported (p. 321) *Echinocaris* sp. [= *Ptychocaris novaki* Copeland] from a stromatoporoid-coral bioherm within the limestone and shale (lower) member of the Blue Fiord Formation (Middle Devonian) on the south side of Eids Fiord, Ellesmere Island. [Copeland (1960a) described the “*Echinocaris*” material reported here as *Ptychocaris novaki* n. sp.]
- Miller, S. A. 1889. *North American Geology and Palaeontology for the Use of Amateurs, Students, and Scientists*. Western Methodist Book Concern, Cincinnati, 664 p. and Second Appendix, p. 719–793.
Diagnosed (p. 545) *Echinocaris* and listed (p. 545–546, 787) articles describing *E. condylepis* Hall, *E. longicauda* Hall (*Ceratiocaris* [= “*Ceratiocaris*”] *longicauda*), *E. multinodosa* Whitfield, *E. punctata* (Hall), *E. pustulosa* Whitfield, *E. socialis* Beecher, *E. sublaevis* (also, spelled correctly as *E. sublevis*) Whitfield, *E.* [= *Eleutherocaris*] *whitfieldi* Clarke, and *E. wrightiana* (Dawson) [= ? *Dunsopterus wrightiana* (Dawson)]. Illustrated (fig. 1002) *E. punctata* (Hall) [modified from Beecher, 1884; the figure is reversed].
- Monroe, C. E., and E. E. Teller. 1899. The fauna of the Devonian formation at Milwaukee, Wisconsin. *Journal of Geology* 7:272–283.
Listed (p. 279) *Echinocaris* (= *Ceraliocaris*) [*sic*] sp. as rare in the Devonian rocks in the lower 21 feet at the cement quarry on the Milwaukee River, immediately north of Milwaukee. [See Cleland, 1911, for a description of *Echinocaris* from this locality.]
- Moore, R. C., and L. McCormick. 1969. General features of Crustacea. In *Treatise on Invertebrate Paleontology*, edited by R. C. Moore, Part R, Arthropoda 4(1), p. R57–R120. Geological Society of America and University of Kansas Press, Lawrence.
Included (p. R113) the Echinocaridinae and the Echinocarididae in an outline of classification of crustaceans.
- Moore, R. C., C. G. Lalicker, and A. G. Fischer. 1952. *Invertebrate Fossils*. McGraw Hill, New York, 766 p.
Illustrated (fig. 14–17C) *Echinocaris socialis* Beecher [modified from Hall and Clarke, 1888] from Upper Devonian, Chemung, sediments of New York.
- Moret, L. 1940. *Manuel de Paléontologie Animale*. Masson et cie, Paris, 675 p.
Considered (p. 294) *Echinocaris* as a Devonian representative of the Phyllocarida which typically inhabited shallow marine habitats. The phyllocarids were considered intermediate between entomostracans and malacostracans.
- _____. 1966. *Manuel de Paléontologie Animale*. Fifth Edition. Masson et cie, Paris, 781 p.
Mentioned (p. 329) *Echinocaris* as a Devonian representative of the phyllocarids. The phyllocarids were considered intermediate between entomostracans and malacostracans.
- Morris, S. F. 1980. *Catalogue of the type and figured specimens of fossil Crustacea (excl. Ostracoda), Chelicerata, Myriapoda and Pycnogonida in the British Museum (Natural History)*. British Museum (Natural History), London, 53 p.
Listed (p. 6) specimen I.3945, *Echinocaris whidbornei* Jones and Woodward, figured by Jones and

- Woodward, 1899, p. 393, Pl. 15, fig. 6, and its counterpart, In.38080, as being deposited in the British Museum (Natural History).
- Müller, A. H. 1963. *Lehrbuch der Paläozoologie*. Band II, Invertebraten. Teil 3, Arthropoda 2—Stomochorda. Gustav Fischer Verlag, Jena, 698 p.
- Diagnosed (p. 92) *Echinocaris* and illustrated (fig. 114) *E. socialis* Beecher from Roger 1953 [which, in turn, was modified from Beecher, 1902].
- Muller [Mueller], K. J. 1967. Devonian of Malaya and Burma. In *International Symposium on the Devonian System*, edited by D. H. Oswald, Vol. 1:565–568. Alberta Society of Petroleum Geologists, Calgary.
- Noted (p. 567), after Pascoe (1959), that the presence of *Echinocaris* [*E. asiatica* Reed] in the Devonian Wetwin fauna of Burma “seems to indicate the proximity of estuarine conditions.” [*Echinocaris*, however, does not indicate such conditions.]
- Murphy, J. L. 1972. *Echinocaris punctata* (Hall) from the Hamilton Group, Thedford, Ontario. *Ohio Journal of Science* 72(3):155–157.
- Described and illustrated (figs. 1, 2) two specimens of *Echinocaris punctata* (Hall), USNM 170561 and 170562, from the Middle Devonian Hamilton Group in, and near, Thedford, Ontario. *Greenops boothii* (Green), *Ponderodictya punctulifera* (Hall), *Tornoceras uniangulare* (Conrad), “*Chonetes*” *lepada* Hall, *Styliolina fissurella* (Hall) and *Tasmanites* sp. are listed as being associated with the *Echinocaris*.
- Newberry, J. S. 1873. Devonian System. *Report of the Geological Survey of Ohio* Vol. I, Geology and Paleontology. Part I, Geology:140–167.
- Noted (p. 166–167) that concretions occurring in the Erie [=Chagrin] Shale, “in the bed of Paine’s Creek, in the north part of Leroy township,” Ohio, contained two crustaceans, one “probably a species of *Ceratiocaris*,” the other an allied but new genus. [The crustaceans, *Echinocaris* and *Palaeopalaemon*, were described by Whitfield in 1880.]
- Nicholson, H. A., and R. Lydekker. 1889. *A Manual of Palaeontology for the Use of Students with a General Introduction on the Principles of Palaeontology*. Third edition. Vol. 1. William Blackwood and Sons, Edinburgh and London, 885 p.
- Noted (p. 514) that, “the curious genus *Echinocaris*,” occurs in the Devonian of North America and briefly described its characters including, “an ovoid folded carapace.”
- O’Connell, M. 1916. The habitat of the Eurypterida. *Bulletin of the Buffalo Society of Natural Sciences* XI(3):1–277.
- Concluded (p. 23) that the single specimen of *Stylonurus* (?) *wrightiana* (Dawson) [=? *Dunsopterus wrightianus* (Dawson)] was part of a jointed appendage. Provided a synonymy (p. 50) including *Echinocaris wrightiana* Jones and Woodward = *Stylonurus* (?) *wrightianus* (Dawson). [See Dawson 1881b.]
- Oehlert, D.-P. 1889. Sur le Dévonien des environs d’Angers. *Bulletin Societe Géologique de France*, Series 3, 17:742–791.
- Reviewed (p. 770–771) the observations of Hall, Whitfield (1880), and Jones and Woodward (1884) that *Echinocaris*, *Tropidocaris*, and *Elymocarid* could confidently be assigned to the phyllocarids and were comparable to the living *Nebalia* and that *Aristozoe*, *Callizoe*, and *Orozoe* were probably also phyllocarids, not leperditoid [ostracodes].
- Olsson, A. 1912. New and interesting fossils from the Devonian of New York. *Bulletins of American Paleontology* 5(23):1–7.
- Reported (p. 7; Pl. 7, figs. 2–4) two specimens [one of which, fig. 2, is now deposited in the collection of the Paleontological Research Institute, Ithaca, numbered 28297] of *Echinocaris punctata* (Hall) collected from the Ithaca Shale beds of the Portage Formation in the McGraw, or University, Quarry on the Cornell University campus. These specimens were associated with *Spirifer mesastrialis* (Hall) and *Cryptonella eudora* Hall. Olsson noted, “its appearance in higher beds [Frasnian], associated with recurrent Hamilton species, and as having changed but little in the time interval.”
- Osgood, R. G., Jr. 1976. Trace fossils of Chagrin Formation (Upper Devonian, Northeast Ohio). *AAPG Bulletin* 60(4):704.
- Mentioned, “enigmatic resting and dwelling traces of what may be a phyllocarid or eocarid crustacean.” [The likely phyllocarid would have been *Echinocaris*. These trace fossils were later assigned to the genus *Chagrinichnites*; see Feldmann et al., 1978 and Hannibal and Feldmann, 1983.]
- Packard, A. S. Jr. 1882. The Palaeozoic allies of *Nebalia*. *American Naturalist* 16:945–953.
- Noted (p. 953) that, “*Echinocaris punctatus* (Hall) [= *E. punctata*] must have been nearly a foot in length, while the *Echinocarides* [sic] . . . described recently by Mr. R. P. Whitfield were considerably smaller.” Illustrated an abdomen of *E. punctatus* (Hall) [= *E. punctata*] (fig. 12), [modified] from Hall [1863], a carapace of *E. multinodosus* Whitfield [= *E. multinodosa*] (fig. 10), [modified from? Whitfield’s unpublished plate], and an abdomen of *E. sublevis* Whitfield (fig. 11) [modified from? Whitfield’s unpublished plate].
- . 1883. A monograph of the phyllopod Crustacea of North America, with remarks on the Order Phyllocarida. *U.S. Geological and Geographical Survey of the Territories, Twelfth Annual Report, Part 1*: 295–592.
- Diagnosed (p. 450) *Echinocaris*, listed (p. 450–451)

- E. sublevis* Whitfield (fig. 71B, after [modified from?] Whitfield[’s unpublished plate]), *E. punctatus* (Hall) [= *E. punctata*] (fig. 70, [modified] from Hall [1863]), *E. armatus* (Hall) = *E. punctatus*, *E. pustulosus* Whitfield [= *E. pustulosa*] and *E. multinodosus* Whitfield [= *E. multinodosa*] (fig. 71A, after [modified from?] Whitfield[’s unpublished plate]), and provided (p. 457) a bibliography of fossil species of phyllocarids. [The figures are the same as those in Packard, 1882.]
- Partridge, E. M. 1902. *Echinocaris whidbornei* (Jones & Woodward) and *Echinocaris sloliensis*, n. sp. *Geological Magazine*, Decade 4, 9:307–308, Pl. 17.
- Described *E. sloliensis* n. sp. (p. 307–308, Pl. XVII, figs. 8, 9) and the abdomen of *Echinocaris whidbornei* Jones and Woodward (p. 307, Pl. XVII, fig. 7) based on specimens from the Marwood beds of Sloley Quarry, near Barnstaple, England. Compared (p. 308) *E. sloliensis* to *E. socialis* Beecher. [The depository of these specimens is recorded in Butler, 1980.]
- Pascoe, E. H. 1959. *A Manual of the Geology of India and Burma*. Vol. 2. Government of India Press, Calcutta, 2:485–1343.
- Listed (p. 688, after Reed, 1908) *Echinocaris asiatica* Reed as occurring in the Upper Devonian Wetwin fauna of Burma and noted that, “*Echinocaris* is characteristic of brackish if not fresh water,” indicating, “the proximity of estuarine conditions.” [The reference to salinity is incorrect.]
- Prosser, C. S. 1898. The classification and distribution of the Hamilton and Chemung series of central and eastern New York, Part 1. *New York State Museum, Forty-ninth Annual Report of the Regents* (New York State Geologist Annual Report 15), 1895, 2:87–222.
- Reported (p. 183) *Echinocaris* cf. [*E.*] *punctata* (Hall) as occurring, very rarely, at a shaly arenaceous horizon, “probably in the lower part of the Ithaca formation,” near Stetsonville, New York.
- Read, M. C. 1873. Geology of Lake County. *Report of the Geological Survey of Ohio*, Vol. I, Geology and Paleontology, Part I, Geology:510–519.
- Noted (p. 519) the occurrence of a new crustacean in nodules found in the Erie [Chagrin] Shale in Paine’s Creek, LeRoy Township, Ohio [This crustacean was probably *Echinocaris*; see Whitfield, 1880.]
- Reed, F. R. C. 1908. The Devonian faunas of the northern Shan States. *Palaeontologia Indica*, New Series, 2(5): 1–183.
- Described (p. 179–180) and illustrated (Pl. XX, fig. 21) *Echinocaris asiatica* n. sp. from the Devonian Wetwin shales near Wetwin, in what is now Burma. The description is based on a portion of a single left valve of a carapace. Reed also described (p. 180) and illustrated (Pl. XX, figs. 22–25) “elongate styliform bodies” that he determined could be “regarded as the cercopods of a species of *Echinocaris*,” probably *E. asiatica*. [These “cercopods” were redescribed by Feldmann, Hannibal and Babcock, 1986 as “Vermes.” Reed’s figured specimens are now deposited in the Geological Survey of India, Calcutta, with the type numbers 9335–9339; the carapace bears the number 9335.]
- Reimann, I. G. 1942. Hamilton phyllocarids in western New York. *Buffalo Society of Natural Sciences, Bulletin* 17(3):48–51.
- Reported (p. 48) the occurrence of *Echinocaris punctata* (Hall) in the Ludlowville Shale at Wanakah and in the Ledyard Shale at Alden and Cazenovia Creek. Described (p. 49) as *Echinocaris* sp. nov.? a specimen, differing from *E. punctata* by the shape and spinosity of the border of its carapace, from the Ledyard Shale at Alden. Reported *E. sp.*, a fragmentary specimen, from the Ledyard Shale at Alden (p. 49) and two mandibles of undetermined phyllocarids from the Wanakah Shale (p. 48). Also noted (p. 48) that *Echinocaris* occurs in the Ludlowville along Lake Erie. Other phyllocarids were also reported.
- Roger, J. 1953. Sous-classe des malacostracés (Malacostraca Latreille 1806). In *Traité de Paléontologie*, edited by J. Piveteau, Tome 3. Onychophores, Arthropodes, Échinodermes, Stomocordés, p. 309–378. Masson et cie, Paris.
- Diagnosed the family Echinocaridae [*sic*] and the genera *Echinocaris* and *Eleutherocaris* (p. 312) and illustrated a specimen of *Echinocaris socialis* Beecher from the Devonian of Pennsylvania (Pl. I, fig. 5) [modified from Beecher, 1902].
- Rolfe, W. D. I. 1962a. The cuticle of some middle Silurian ceratiocaridid Crustacea from Scotland. *Palaeontology* 5(2):30–51.
- Noted (p. 48) Clarke’s (1921) figuring of borings, “*Clionolithes*,” on *Echinocaris*.
- . 1962b. Grosser morphology of the Scottish Silurian phyllocarid crustacean, *Ceratiocaris papilio* Salter in Murchison. *Journal of Paleontology* 36(5):912–932.
- Noted (p. 917) that some *Echinocaris* species have nodes along the hinge line that differ from the tubercles on the valves of the carapace, referring to such nodes on *E. punctata* (Hall) and *E. socialis* (Beecher). Also (p. 925) quoted remarks of Beecher (1884) on the mandible of *E. punctata*.
- . 1962c. A new phyllocarid crustacean from the Upper Devonian of Ohio. *Breviora* 151:1–7.
- Noted (p. 4) that the dorsal head of the telson style of *Ohiocaris wycoffi* Rolfe is similar to that of *Echinocaris sublevis* Whitfield and (p. 5) that the smooth last abdominal segment of *O. wycoffi* differs from every species of *Echinocaris*. Also noted (p. 6) that the Harvard Museum of Comparative Zoology specimen of *O. wycoffi* is part of a collection containing *E. multinodosa* Whitfield and *E. sublevis*.

- _____. 1969. Phyllocarida. In *Treatise on Invertebrate Paleontology*, edited by R. C. Moore, Part R, Arthropoda 4(1), p. R296–R331. Geological Society of America and University of Kansas Press, Lawrence.
- Diagnosed, and corrected, when necessary, the names of (p. R317–R318) the Echinocarididae, the Echinocaridinae, *Echinocaris* and related taxa. Commented on various aspects of phyllocarid biology and ecology, including (p. R305) the mandibular palps of *Echinocaris* and (p. R303) Beecher's correlation of carapace lobes to cephalic appendages, and (p. R308) the lack of evidence for archaeostracans being fluviatile or "continental." Noted (p. R298) that prismatic structures are found in the integument of *Echinocaris* and provided a chart (fig. 122) of morphological features observed in various phyllocarid genera, including *Echinocaris*. Illustrated *E. socialis* Beecher (fig. 141,1), *E. punctata* (Hall) (fig. 142,3a&b) [after Hall, 1888, which, in turn, were modified from Hall, 1863], and *E. randallii*? Beecher (fig. 128). Diagnosed (p. R319) *Eleutherocaris* and illustrated (fig. 142,4a&b) rubber molds of the holotype of *Echinocaris* (= *Eleutherocaris*) *whitfieldi* (Clarke).
- _____. 1981. Phyllocarida and the origin of the Malacostraca. *Geobios* 14:17–27.
- Suggested (p. 18) homologies of the carapace grooves of *Echinocaris* with those of *Montecaris* and decapods, illustrating the carapace of *Echinocaris multinodosa* Whitfield (Fig. 1A, C, drawn from Sturgeon et al., 1964). Reported (p. 21) and illustrated (fig. 3; Pl. 1B) apertures for limb insertion on abdominal somites 3 and 4 of *Echinocaris punctata* (Hall) from Kashong Glen, New York. Suggested (p. 21) that the large size, and large mandibles, of archaeostracans indicate that they were not filter feeders, but were probably macrophagous.
- Rolfe, W. D. I., and R. H. Denison. 1966. The supposed fish *Pseudodontichthys* Skeels, 1962, is the phyllocarid crustacean *Dithyrocaris*. *Journal of Paleontology* 40(1):214–215.
- Concluded that mandibles erroneously identified as belonging to a chondrichthyan by Skeels (1962) "are identical with the 'Mandibles of Phyllocarida' figured by Hall and Clarke . . . although it is still uncertain whether these belong to *Dithyrocaris* (= *Mesothyra*) or to unusually large *Echinocaris*." [See also Dunkle, 1965.]
- Rolfe, W. D. I., and V. A. Edwards. 1979. Devonian Arthropoda (Trilobita and Ostracoda excluded). *Special Papers in Palaeontology* 23:325–329.
- Discussed the stratigraphic value of phyllocarids, providing (text fig. 2) a chart showing the geologic age of species of *Echinocaris*, *Eleutherocaris*, and other Devonian phyllocarids, as well as their inferred phylogenetic links. The range of *Echinocaris* in the Devonian was given as earliest Givetian to late Famennian. Also noted (p. 328) that revision of the Russian species of *Echinocaris* is needed.
- Rollins, H. B., N. Eldredge, and R. M. Linsley. 1972. Paleontological problems of the Hamilton Group (Middle Devonian). In *Field Trip Guidebook (44th Annual Meeting, Hamilton) New York State Geological Association*, edited by J. McLelland, p. F–1–F–28.
- Listed (p. F–7) *Echinocaris* sp. from the Solsville Member, Marcellus Formation, at the Peterborough South Quarry, near Morrisville, New York, and *E. punctata* (Hall) from the Ludlowville Formation at the "Pierceville" (=Bradley Brook) Quarry, Pierceville, New York (p. F–18) and from the Moscow Formation at the Deep Spring Quarry, Lebanon, New York (p. F–26).
- Sartenaer, P. 1969. Late Upper Devonian (Famennian) rhynchonellid brachiopods from Western Canada. *Geological Survey of Canada Bulletin*, 169:1–269.
- Lists (p. 4) *Echinocaris* sp. and other taxa as occurring in the *Eoparaphorhynchus* zone (Lower Famennian) of western Canada. [The *Echinocaris* material was described in Copeland, 1960a as *E. castorensis* Copeland and *E. consanquina* Eller.]
- Sass, D. B., and R. A. Condrate. 1985. Destruction of a Late Devonian ophiuroid assemblage: a victim of changing ecology at the Catskill delta front. In *The Catskill Delta*, edited by D. L. Woodrow and W. D. Sevon. *Geological Society of America Special Paper* 201:237–246.
- Noted (p. 238) that the earliest occupants of the environment represented by the lower member of the Upper Devonian Alfred Shale, exposed in the vicinity of Alfred Station, N. Y., may have been malacostracans, for example *Echinocaris*, and infaunal burrowers. These were succeeded by a more diverse fauna. Also illustrated phyllocarids [including *Echinocaris*?] in a reconstruction (fig. 6) of the sea bottom during "Alfred Station time."
- Schram, F. R. 1986. *Crustacea*. Oxford University Press, New York, 606 p.
- Referred, after Krestovnikov, 1961, and Chlupaiuc, to echinocaridines as, "benthic reef-dwelling forms" (p. 328) and illustrated (fig. 26–4A) *Echinocaris socialis* Beecher [incorrectly identified as *E. punctata* (Hall)] (after Rolfe, 1969). Concurred (p. 329) with Rolfe (1969) that large mandibles possessed by archaeostracans may not confirm a carnivorous habit but that, alternatively, they may have been scavengers and detritus feeders.
- Schuchert, C. 1943. *Stratigraphy of the Eastern and Central United States*. Wiley, New York, 1013 p.
- Included (p. 105) *Echinocaris punctata* (Hall) in a list of taxa (after Clarke, 1905) from the Ithaca fauna (Upper Devonian, Naples Stage) of New York. Re-

- ported (p. 106) *Echinocaris* [= *Eleutherocaris*] *whitfieldi* Clarke, and, after Clarke, 1904, *Eleutherocaris whitfieldi*, from the Naples fauna of New York. Also reported (p. 112, after Caster, 1934) *Echinocaris* from the Devonian Conneaut beds of Pennsylvania.
- Scott, W. B. 1907. *An Introduction to Geology*. Second Edition. Macmillan, New York, 816 p.
Illustrated (Pl. IX, fig. 19) *Echinocaris punctatus* (Hall) [= *E. punctata*] on a plate illustrating Devonian fossils. [The illustration is a combination of figs. 1 and 2, Pl. 28, in Hall, 1888, with a restored abdomen added.]
- Sepkoski, J. J., Jr. 1982. A compendium of fossil marine families. *Milwaukee Public Museum Contributions in Biology and Geology*, Number 51:1–125.
Noted (p. 60) the range of the Echinocarididae as being Siegenian through Tournaisian.
- Shimer, H. W., and R. R. Shrock. 1944. *Index Fossils of North America*. Technology Press, Massachusetts Institute of Technology, Cambridge, 837 p.
Gave a diagnosis (p. 657) of *Echinocaris* and illustrated (Pl. 279) *E. socialis* Beecher (figs. 32, 39) and *E. sublevis* Whitfield [spelled incorrectly as *E. sublaevis* in the figure caption] (figs. 37, 38, 41) after Hall and Clarke, 1888, and *E. punctata* (Hall) (fig. 42) after Hall and Clarke, 1888, which, in turn, is modified from Beecher, 1884.
- Skeels, M. A. 1962. Two new fishes from the Middle Devonian Silica Formation, Lucas County, Ohio. *Journal of Paleontology* 36(5):1039–1046.
Described (p. 1043–1045, text figs. 2A–D, 3), as a chondrichthyan, *Pseudodontichthys whitei* n. gen. and sp. [This fossil was later identified as representing the mandible of a phyllocarid. Some authors have considered it to be *Echinocaris*. See Dunkle, 1965 and Rolfe and Denison, 1966.]
- Smith, B. 1935. Geology and mineral resources of the Skaneateles quadrangle. *New York State Museum Bulletin* 300:1–120.
Included *Echinocaris punctata* (Hall) in a list (p. 106) of conspicuous and characteristic Paleozoic fossils of the Skaneateles quadrangle having been noted in the Otisco Member of the Ludlowville Formation in the platform which underlies the Staghorn Point submember.
- Špinar, Z. 1960. *Základy Paleontologie Bezobratlých*. Československé akademie věd, Prague, 834 p.
Mentioned (p. 598) *Echinocaris* as a Paleozoic phyllocarid and illustrated (fig. X–85A) *Echinocaris socialis* Beecher after [modified from] Roger, 1953 [which, in turn, was modified from Beecher, 1902].
- Steinmann, G., and Döderlein, L. 1890. *Elemente der Paläontologie*. Wilhelm Engelmann, Leipzig, 848 p.
Described (p. 501) *Echinocaris* and provided a diagrammatic illustration (fig. 596) [modified from Beecher, 1884] of *E. punctata* (Hall).
- Straelen, Van. See Van Straelen.
- Stukel, D. J. II. 1986. Ichnology and environmental analysis of the Chagrin Shale (Famennian), Northeast Ohio. *Geological Society of America Abstracts with Programs* 18(4):326.
Commented on the occurrence of *Zoophycos* and *Chagrinichnites* within the same horizon of, and throughout, the Chagrin Shale of northeastern Ohio. Suggested, based on the occurrence of *Lingulichnus* and *Chagrinichnites* that the Chagrin represented a shallow water environment, deepening to the west.
- Stromer von Reichenbach, E. 1909. *Lehrbuch der Paläozoologie*. I. Teil. Wirbellose Tiere. B. G. Teubner, Leipzig, 342 p.
Briefly discussed (p. 286) the Archaeostraca, noting that some forms probably had a double-valved shell and a spiniform telson. Illustrated (fig. 359) *Echinocaris socialis* Beecher, after Beecher, 1902, as an example.
- Stumm, E. C., and R. B. Chilman. 1969. Phyllocarid crustaceans from the Middle Devonian Silica Shale of northwestern Ohio and southeastern Michigan. *Contributions from the Museum of Paleontology, University of Michigan* 23(3):53–71.
Provided (p. 65–66) a short synonymy and a diagnosis for *Echinocaris*. Described *E. punctata* (Hall) (p. 66, Pl. 1, figs. 1–15; Pl. 2, figs. 1–5) from the Middle Devonian Silica Shale of Ohio, and reported the species as being abundant in the same beds as *Rhinocaris*. Included a description (p. 66) of the mandibles of *E. punctata*, with illustrations of a specimen from the Windom Shale of New York (Pl. 2, fig. 6) as well as the Silica Shale. Also described (p. 54, 60, 63, Pl. 7, figs. 10–15) mandibles, belonging either to *Dithyrocaris* or *Hebertocaris*, some of which have been considered by other authors (e.g. Dunkle, 1965) to belong to, or possibly belong to, *Echinocaris*.
- Sturgeon, M. T., W. J. Hlavin, and R. V. Kesling. 1964. Rare crustaceans from the Upper Devonian Chagrin Shale in northern Ohio. *Contributions from the Museum of Paleontology, University of Michigan* 19:47–64.
Reported, described or remarked on, and illustrated, *Echinocaris multinodosa* Whitfield (p. 49–51, Pl. I, figs. 1–5; Pl. II, figs. 1–4; Pl. V, fig. 10), *Echinocaris* sp. cf. *E. multinodosa* (p. 51, Pl. V, figs. 7, 8), *E. sublevis* Whitfield (p. 52, Pl. V, figs. 1, 2), *E. pulchra* n. sp. (p. 52–53, Pl. III, figs. 1–5), *E. ohioensis* n. sp. (p. 53–55, Pl. IV, figs. 1–4), and *E. sp.* (p. 55–56, Pl. IV, fig. 5; Pl. V, fig. 3). All of the taxa reported were found in concretions from exposures in the Mill Creek area, Ashtabula County, Ohio. *Echinocaris multinodosa* was also reported from Euclid Creek, Cuyahoga County, Ohio. A composite diagram (fig. 1) of *Echinocaris* was also presented and some other fossils found in concretions in the Mill Creek area

were also described. [Weidner and Feldmann, 1985, redescribed some of these taxa, synonymizing *E. pulchra* with *E. sublevis*.]

Szmuc, E. J. 1970. The Devonian System. In *Guide to the Geology of Northeastern Ohio*, edited by P. O. Banks and R. M. Feidmann, p. 9–21. Northern Ohio Geological Society.

Noted (p. 13) that the fossil assemblages of the Chagrín Shale are, “remarkable in that, except for isolated occurrences of arthropod remains (*Echinocaris*), they consist almost entirely of brachiopods . . . and mollusks.”

Tchernyshev. See Tschernyshev

Tesmer, I. H. 1975. Geology of Cattaraugus County, New York. *Buffalo Society of Natural Sciences Bulletin* 27:1–105.

Illustrated (Pl. 5, fig. A) a specimen of *Echinocaris*, identified as *E. cf. [E.] socialis* Beecher, from undifferentiated Canadaway in Freedom Township, Cattaraugus County, New York. The right valve of the carapace and much of the abdomen can be seen in Tesmer's photograph.

Tschernyshev, B. I. 1928. Phyllocaridae from the Devonian of the Urals. *Annuaire de la Société Paléontologique de Russie* 7:132–135.

Described and illustrated (p. 132–133; Pl. IX, figs. 1–3) *Echinocaris arschae* n. sp. and (p. 133–134, Pl. IX, figs. 4, 5) *Echinocaris* n. sp. from the Devonian, “reef limestone overlying the *Stringocephalus Burtini* beds on the Arsha River,” in the South Urals. Briefly compared *E. n. sp.* to *E. randallii* Beecher and noted that the specimens referred to as *E. n. sp.* may be young individuals of *E. arshae*. [In Russian, with an English summary.]

———. 1933. Arthropods from the Urals and other regions of the U.S.S.R. *Paleontology and Stratigraphy Magazine*, Leningrad 1:15–24.

Described *Echinocaris tudrensis* n. sp. (p. 19, 23, Pl. I, figs. 5–5a) from the Devonian rocks on the right bank of the M. Tudr River, at Bilovo Village. Compared the new species with *E. condylepis* Hall and Clarke, *E. punctata* (Hall), and *E. socialis* Beecher. [In Russian, with an English summary. See also Tschernyshev, 1941.]

———. 1938. Some Phyllocarida of the Urals and the north-western district. *Materials of the Central Geological and Prospecting Institute, Leningrad (Gen. Series)* 3:71–79.

Discussed the occurrences of *Echinocaris* in the Urals and northwestern district, postulating that these phyllocarids lived in a district isolated from other phyllocarids and that their fossils were allochthonous. Discussed the genus *Echinocaris* (p. 73), mentioning the American species *E. multinodea* and *E. clarke* [= *E. clarkii*]. Noted (p. 73–74, 78)

the occurrence of *E. arschae* Tschernyshev (spelled, incorrectly, *E. aschae* on p. 73). Described *E. uralensis* n. sp. (p. 74, 78, Pl. I, figs. 4–6) from Sukhoy Spring, *E. sp. I* (p. 74–75, 78, Pl. I, fig. 7) from opposite Terebum Village along the Syas River, *E. sp. II* (p. 75, 78, Pl. I, fig. 10) from Bogoslovskaya Dacha, *E. sp. III* (p. 75, 78, Pl. I, fig. 11) from the Ura-tubin southern slope, and *E. (?) brevicarinata* n. sp. (p. 75, 79, Pl. I, figs. 8–9) from the Bogoslovskaya Dacha and the Sungurduk River. [In Russian, with English summary. Rolfe and Edwards (1979) noted that *E. uralensis* and other Russian species were too poorly illustrated for identification, even to the generic level.]

———. 1941. Phyllocarida of the Main Devonian Field. In *Fauna of the Main Devonian Field I*, edited by R. F. Gekker, p. 313–317. USSR Academy of Sciences, Palaeontological Institute, Moscow.

Described the genus *Echinocaris* (p. 315) and described *E. tudrensis* Tschernyshev, 1933 (p. 315–316, 317, Pl. II, fig. 10a&b) from the Bilovo Series (of the Upper Variegated series, Famennian) near Bilova and *E. sp.* (p. 316–317, Pl. II, fig. 11) from the Pskov beds (Frasnian) opposite Terebuny. Noted (p. 317) that phyllocarid remains are extremely scarce in the Main Devonian Field of the Russian Platform. [In Russian, with English summary. See also Gekker, 1941.]

Twenhofel, W. H., and R. R. Shrock. 1935. *Invertebrate Paleontology*. McGraw-Hill, New York, 511 p.

Noted (p. 444) that *Echinocaris* is a typical genus of fossil Nebaliacea and illustrated (fig. 163D), after Beecher, 1902, *Echinocaris socialis* Beecher.

Van Straelen, V., and G. Schmitz. 1934. Crustacea Phyllocarida (=Archaeostraca), pt. 64:1–246. In *Fossilium Catalogus I, Animalia*, edited by W. Quenstedt. W. Junk, Berlin.

Listed (p. 88–94, 95, 179–180, 182–183) most articles published through 1930 that discussed, mentioned, and/or illustrated *Echinocaris* and species and specimens that had been referred to the genus, including *Eleutherocaris (Echinocaris) whitfieldi* Clarke, “*Ceratiocaris*” *longicauda* Hall and “*Echinocaris*” (*Stylonurus*?) [= *Dunsophterus*] *wrightianus* (Dawson). Also corrected many names. [Many, but not all, of the corrections are used by us in this bibliography.] Articles are listed by taxon and synonyms are given.

Vogdes, A. W. 1889. A catalogue of North American Palaeozoic Crustacea confined to the non-trilobite genera and species. *New York Academy of Science Annals* 5:1–38.

Provided (p. 16) a diagnosis of *Echinocaris* after Hall and Clarke, 1888, and listed (p. 16–18) articles referring to the following species of *Echinocaris*: *E. con-*

- dylepis* Hall and Clarke, *E. multinodosa* Whitfield, *E. punctatus* Hall (also spelled *E. punctata*), *E. pustulosa* Whitfield, *E. socialis* Beecher, *E. sublevis* Whitfield (also spelled *E. sublaevis*), and *Echinocaris* [= *Eleutherocaris*] *whitfieldi* Clarke. Also listed (p. 35) articles referring to *Stylonurus* [= ? *Dunsopterus*] *wrightianus* (Dawson). The names used are those of the original authors. Entries for some forms referred to *Echinocaris* were also included under other generic names, for instance, *Ceratiocaris*. Illustrated (p. 16) *Echinocaris* [*punctata* (Hall)], modified from Hall and Clarke, 1888, which, in turn, was modified from Beecher, 1884].
- _____. 1890. A bibliography of Paleozoic Crustacea from 1698 to 1889. *U. S. Geological Survey Bulletin* 63:1–177.
- Diagnosed (p. 16) *Echinocaris*. Listed (p. 16–18) articles referring to *Echinocaris condylepis* Hall and Clarke, *E. multinodosa* Whitfield, *E.* (= *Ceratiocaris*? = *Ceratiocaris* = *Ceratiocaris* [*Aristozoe*]) *punctatus* (Hall) (= *E. armatus*) [= *E. punctata*], *E. pustulosa* Whitfield, *E. socialis* Beecher, *E. sublevis* Whitfield (= *E. sublaevis*), and *E. whitfieldi* Clarke. Also listed articles (p. 19, 35) referring to *Stylonurus* (= *Equisetides* = *Echinocaris* = ? *Echinocaris*) *wrightianus* (Dawson).
- _____. 1893. A classed and annotated bibliography of the Palaeozoic Crustacea, 1698–1892, to which is added a catalogue of North American species. *Occasional Papers of the California Academy of Sciences* 4:1–412.
- In an annotated list of works arranged alphabetically by author, noted species referred to *Echinocaris* (at one time or another) as being included in Beecher, 1884 (p. 18), Clarke, 1885 (p. 37), Hall, 1863 (p. 84), Hall, 1876 (p. 87), Hall and Clarke, 1888 (p. 88–89), Jones and Woodward, 1884 (p. 110), Etheridge, Woodward and Jones, 1885 [= 1886] (p. 112) and 1889 [= 1891] (p. 119), Packard, 1883 [= 1882] (p. 171), Whitfield, 1880 (p. 235), and Woodward and Jones [= Jones and Woodward], 1884, (p. 250). Also listed, in a separate list arranged alphabetically by taxon, articles mentioning *E. condylepis* [= *E. condylepis*] Hall and Clarke, *E. multinodosa* Whitfield, *E.* (*Ceratiocaris*) *punctatus* (Hall) [= *E. punctata*], *E. pustulosa* Whitfield, *E. socialis* Beecher, *E. sublevis* Whitfield (also spelled *E. sublaevis*), *E.* [= *Eleutherocaris*] *whitfieldi* Clarke, *E. wrightiana* (Dawson) (p. 383–384), *Equisetides* [= ? *Dunsopterus*] *wrightiana* (p. 385) and *Stylonurus* (*Equisetides*) [= ? *Dunsopterus*] *wrightianus* (Dawson) (p. 407). Synonyms were supplied.
- _____. 1917. Palaeozoic Crustacea. The publications and notes on the genera and species during the past twenty years, 1895–1917. *Transactions, San Diego Society of Natural History* 3(1):1–141.
- Listed species referred to *Echinocaris* mentioned in various articles as follows: *Echinocaris punctata* (Hall) (p. 24) in Cleland, 1903; *E. whidbornei* Jones and Woodward (p. 46) in Jones and Woodward, 1899; *E. socialis* Beecher (p. 66) in Partridge, 1902 [not 1912]; *E. sublevis* Whitfield, *E. pustulosa* Whitfield and *E. multinodosa* Whitfield (p. 135) in Whitfield, 1893; and *Stylonurus* [= ? *Dunsopterus*] *wrightianus* (Dawson) in Clarke and Ruedemann, 1912.
- _____. 1925. Palaeozoic Crustacea. Part I, A bibliography of Palaeozoic Crustacea, supplementing the author's previous papers on the same subject. *Transactions of the San Diego Society of Natural History* 4:5–88.
- Abstracted (p. 48) Reed's 1909 description of *Echinocaris asiatica* Reed and noted (p. 88) the inclusion of *Echinocaris* in the 5th edition of Zittel's *Grundzüge der Palaeontologie*.
- Waterston, C. D. 1968. Further observations on the Scottish Carboniferous eurypterids. *Transactions of the Royal Society of Edinburgh* 68:1–20.
- Noted (p. 12) the similarity of the massive prosomal appendages associated with *Dunsopterus stevensoni* (R. Etheridge, Jr.) to "the controversial specimen . . . still known as *Stylonurus* (?) *wrightianus* (Dawson)" and, on this basis, placed (p. 18) the genus *Dunsopterus* in the Stylonuracea. Placed (Table 1) *S.* (?) *wrightianus* questionably in *Dunsopterus* as *Dunsopterus* (?) *wrightianus* (Dawson) and that genus tentatively in the Stylonuridae. [See also Dawson, 1881b.]
- Weidner, W. E., and R. M. Feldmann. 1983. Paleocological interpretation of echinocarid arthropod assemblages in the Late Devonian Chagrin Shale, northeast Ohio. *Geological Society of America Abstracts with Programs* 15(4):248–249.
- [See Weidner and Feldmann, 1985.]
- _____. 1985. Paleocological interpretation of echinocarid arthropod assemblages in the Late Devonian (Famennian) Chagrin Shale, northeastern Ohio. *Journal of Paleontology* 59(4):986–1004.
- Described five echinocarid-bearing concretionary horizons from two exposures of the Chagrin Shale (Famennian) in Lake and Ashtabula counties, Ohio. Remarkable on the genus *Echinocaris* (p. 989) and on *E. multinodosa* Whitfield (p. 989, figs. 3.5–3.9), *E. ohioensis* Sturgeon, Hlavin and Kesling (p. 989–990, figs. 4.9–4.11), *E. sublevis* Whitfield (p. 990–992, figs. 3.1–3.4) and *E. sp.* (p. 992–995, figs. 4.1–4.3). Considered *E. pulchra* Sturgeon, Hlavin and Kesling, 1964, to be a synonym of *E. sublevis* Whitfield, 1880, providing a synonymy of *E. sublevis*. Noted the occurrence of a presumed echinocarid trace, *Chagrinichmites osgoodi* (p. 995–996, figs. 5.1–5.2) from along the Chagrin River. Divided the upper

- portion of the Chagrin Shale into two ichnofacies, the *Lingulichnus* ichnofacies and the *Chagriniichnites* ichnofacies. Discussed the sedimentological setting of *Echinocaris* in the Chagrin Shale and characterized the crustacean (p. 1002–1003) as an epifaunal detritus feeding arthropod, “well adapted to the turbulent, periodically nutrient-poor . . . offshore environment, owing to their mobility and success in utilizing a broad range of food.”
- Whidborne, G. F. 1896a. A preliminary synopsis of the fauna of the Pickwell Down, Baggy, and Pilton beds. *Proceedings of the Geologist's Association* 14(9): 371–377.
Listed (p. 371) *Echinocaris whidbornei* Jones and Woodward as occurring in the Marwood, Baggy and Soly beds. [See Whidborne, 1896b.]
- . 1896b. *A monograph of the Devonian fauna of the south of England*. Vol. 3, Part 1, The fauna of the Marwood and Pilton beds of North Devon and Somerset. London, Palaeontographical Society, 112 p.
Redescribed (p. 6–7) *Echinocaris whidbornei* Jones and Woodward, 1889. Cited two specimens of the species, the type specimen (Pl. I, fig. 3) from the Marwood series, near Soly and another, fragmentary, specimen from Pilton (in the Porter Collection).
- Whitfield, R. P. 1880. Notice of new forms of fossil crustaceans from the Upper Devonian rocks of Ohio, with descriptions of new genera and species. *American Journal of Science*, Third Series, 19:33–42.
Proposed (p. 33–34) the name *Echinocaris* for *Ceratiocaris punctatus* Hall, 1863, and three newly described species from Ohio. Provided a diagnosis of the genus (p. 34) and compared it to *Ceratiocaris* and other genera then considered members of the Ceratiocaridae (p. 34–36). Described *E. sublevis* n. sp. (p. 36–37), designating it (p. 34) as the type species of the genus, *E. pustulosa* n. sp. (p. 38), and *E. multinodosa* n. sp. (p. 38–39) from calcareous concretions [the concretions are actually phosphatic; there is little calcareous material in them] in the Erie Shale [=Chagrin Shale, Famennian] at Leroy, Ohio. Also described the decapod *Palaeopalaemon newberryi* n. gen. and sp. (p. 39–42), found associated with *Echinocaris*. [Although this work was published without illustrations, plates were evidently supplied with the author's special edition (fide Vogdes, 1893, p. 383) and other authors copied some of the illustrations on these plates. Feldmann and McKenzie (1981, p. 386) suggested that Indian Point, Lake County, Ohio, may be Whitfield's type locality. However Indian Point is actually in Perry Township, whereas Newberry (1873) indicated that the specimens were found in northern Leroy township. The type locality is probably somewhere along Paine's Creek upstream of Indian Point, perhaps at Hell Hollow (Hell Hole), which is just to the east of the present town of Leroy Center. Both Indian Point and Hell Hollow are Lake County metropolitan parks. Permits are necessary to collect fossils in them.]
- . 1890. Contributions to invertebrate paleontology [of Ohio]. *New York Academy of Science Annals* 5:505–620.
Described *Echinocaris*. Reported and described (p. 560–573) various fossils, including *E. sublevis* Whitfield (p. 565–567, Pl. XII, figs. 12–14), *E. pustulosa* Whitfield (p. 567, Pl. XII, fig. 15), and *E. multinodosa* Whitfield (p. 568, Pl. XII, fig. 16), from the Erie Shales [=Chagrin Shale, Famennian] at Leroy, Ohio. [Pages 562–572 of this article are essentially a reprint of Whitfield, 1880, which was published without illustrations. The specimens of *Echinocaris* described and/or figured in this article are now in the American Museum of Natural History, Columbia University Collection, numbered 12281 and 12282 (*E. sublevis*), 5512G (*E. pustulosa*), and 5511G, 12278 and 12280 (*E. multinodosa*.)]
- . 1892. Discovery of a second example of the macrouran decapod crustacean, *Palaeopalaemon newberryi*. *The American Geologist* 9:237–238.
Described a specimen of *Palaeopalaemon newberryi* that had been sent to Whitfield “under the name *Echinocaris* sp.”
- . 1893. Contributions to the paleontology of Ohio. *Report of the Geological Survey of Ohio* 7(2):407–494.
The sections dealing with or mentioning *Echinocaris*, “Fossils from the Erie Shales” (p. 452–462) and “Species from the Huron Shales” (p. 462–464) are reprints of p. 560–572 and p. 573–575 of Whitfield, 1890. The plate, Pl. VIII, is a reproduction of Pl. XII in Whitfield, 1890; both plate numbers are indicated at the top of the plate.
- . 1899. List of fossils, types and figured specimens, used in the palaeontological work of R. P. Whitfield, showing where they are probably to be found at the present time. *New York Academy of Sciences Annals* 12:139–186.
Listed (p. 182) the type specimens of *Echinocaris multinodosa* Whitfield, *E. pustulosa* Whitfield, and *E. sublaevis* Whitfield [= *E. sublevis*], as published in Whitfield, 1890, as being located at Columbia College. [These specimens are now at the American Museum of Natural History; see Whitfield, 1890.]
- Willard, B. 1932. Devonian faunas in Pennsylvania. *Pennsylvania Geological Survey, Bulletin*, Fourth series, G4:1–43.
Reported *Echinocaris* sp. in a faunule 3.8 miles east of Wellsboro, Tioga County (p. 28), *E. cf. E. sublaevis* [= *E. cf. E. sublevis*] Whitfield in a faunule found in the Hollenback region, Bradford County (p. 31, 34), and *E. cf. [E.] multinodosa* Whitfield in a faunule found in Monroe County (p. 37, 40), Pennsylvania.

- The age of the first two faunules is given as Chemung; the age of the third as Ithaca. The first and third faunules are composed of marine elements, the second, found in redbeds and associated strata, is composed of marine and nonmarine elements, including the fish *Bothriolepis*.
- _____. 1935. Hamilton Group of central Pennsylvania. *Geological Society of America Bulletin* 46:195–224.
Listed (p. 211) *Echinocaris punctata* (Hall) as occurring very rarely and *E. sp. nov.* as occurring rarely in the Ludlowville faunal facies of the Mahantango Formation of the Hamilton Group in Pennsylvania.
- Willard, B., F. M. Swartz, and A. B. Cleaves. 1939. The Devonian of Pennsylvania. *Pennsylvania Geological Survey, Bulletin*, Fourth Series, G19:1–481.
Reported (p. 177) *Echinocaris?* from the Moscow beds (Hamilton) north of Auburn, Pennsylvania. Listed *E. punctata* (Hall) (p. 190, Pl. 31, fig. 26) as occurring, very rarely, and *E. sp. nov.* as occurring, rarely, in the Ludlowville portion of the Mahantango Formation (Hamilton). Listed (p. 213) *Echinocaris* (?) *sp. nov.* as occurring in the Trimmers Rock fauna (Portage Group) of south-central Schuylkill County. Also, illustrated *E. multinodosa* Whitfield (Pl. 31, fig. 25) [probably = *E. cf. E. multinodosa* of Willard, 1932] from the Trimmers Rock Sandstone in Monroe County and *E. sublaevis* Whitfield [= *E. sublevis*, probably *E. cf. E. sublaevis* in Willard, 1932] from the Canadaway in Bradford County. [The specimens are too poorly illustrated to judge the accuracy of the identifications of the echinocaridids, even to the generic level.]
- Williams, H. S., and E. M. Kindle. 1905. Contributions to Devonian paleontology, 1903. Part I. Fossil faunas of the Devonian and Mississippian (“Lower Carboniferous”) of Virginia, West Virginia, and Kentucky. *United States Geological Survey, Bulletin* 244, Part 1:9–58.
Reported (p. 37; chart facing p. 55) the rare occurrence of *Echinocaris sp.* in a Devonian (Chemung) faunule near White Sulphur Springs in southeastern West Virginia. [The whereabouts of the documenting specimen(s) is unknown.]
- Woods, H. 1909. *Palaeontology: Invertebrate*. Fourth edition. The University Press, Cambridge, England, 388 p.
Mentioned (p. 323) that *Echinocaris* is found in the Devonian and (p. 322) that the Leptostraca (Phyllocarida) “are all marine, and live mainly in shallow water or at moderate depths.”
- Woodward, H. P. 1943. Devonian System of West Virginia. *West Virginia Geological Survey [Report]* 15:1–655.
Listed (p. 366) *Echinocaris punctata* (Hall) as occurring in Hamilton rocks elsewhere than West Virginia.
- Wright, B. H. 1884. Notes on the geology of Yates County, N.Y. *Thirty-fifth Annual Report on the New York State Museum of Natural History* 35:195–206.
Described (p. 196–197), after Dawson, 1881b, and illustrated (Pl. XV, figs. 1–3, figs. 1 and 3 after [modified from] Dawson, 1881b) *Equisetides wrightiana* Dawson [= ? *Dunsopteris wrightianus* (Dawson)]. [See also Hall, 1884.]
- Zell, P. D. 1985. *Paleoecology and stratigraphy of the Middle Devonian Moscow Formation in the Chenango Valley, New York*. Unpublished M. S. thesis, University of Pittsburgh, 128 p.
Found phyllocarids, particularly *Rhinocaris columbina* Clarke and *Echinocaris punctata* (Hall) to be rare but persistent elements in the Moscow fauna of the Chenango Valley (p. 55) with the latter, “more common in the coarse siltstones in the upper, shallower, portions of cycles.” Reported *E. punctata* as occurring in a *Devonochonetes-Mucrospirifer* community (p. 44, Table 6) and a *Tropidoleptus* community (p. 50, Table 8). Listed *E. punctata* (p. 83, 118, 122) from six localities in the Chenango Valley. Commented on the life habits of *E. punctata* (p. 55–56), finding it to be, “an epifaunal scavenger/predator on silty substrates with currents of moderate energy.” Reported (p. 56) the epizoans ? *Concho-trema* (Appendix D, Pl. 2.4) and *Orbiculoidea doria* (Appendix D, Pl. 1.3) associated with the carapace of *E. punctata*.
- Zittel, K. A. 1880–1885. *Handbuch der Palaeontologie*. Part I. Palaeozoologie. Vol. II. Mollusca und Arthropoda. R. Oldenbourg, Munich, 893 p.
Described (p. 658) *Echinocaris* and illustrated (fig. 846) *E. punctata* (Hall), Beecher, 1884. [The illustration is reversed. This same picture is reproduced in the following Zittel entries.]
- _____. 1887. *Traité de Paléontologie*. Tome II. Paléozoologie. Partie I. Mollusca et Arthropoda. Octave Doin Éditeur, Paris, 897 p.
Described (p. 655) *Echinocaris* and illustrated (fig. 863) *E. punctata* (Hall), [after an earlier Zittel which, in turn, was] after [modified from] Beecher [1884]. [The illustration is reversed.] *Echinocaris* is included in a table (p. 658) listing the geologic distribution of phyllocarids.
- _____. 1900. *Text-book of Palaeontology*. Vol. 1, edited by C. R. Eastman. Macmillan and Co., New York, 706 p.
J. M. Clarke, in this work, named and diagnosed the Echinocaridae [sic] (p. 655) [see Chlupáč, 1963], and diagnosed *Echinocaris* (p. 655–6) and p. 656) *Eleutherocaris* [the latter for the first time, but without an illustration or a mention of any species belonging to it; see Clarke, 1902.] Illustrated (fig. 1373)

- Echinocaris punctata* (Hall), [after an earlier Zittel which, in turn, was] after [modified from] Beecher, 1884. [The illustration is reversed.] Also illustrated "gastric teeth" [mandibles] of *E. punctata* (fig. 1369a&b) [modified from Hall and Clarke, 1888, which, in turn, were modified from Beecher, 1884].
- . 1903. *Grundzüge der Paläontologie (Paläozoologie)*. Second edition. I. Abteilung: Invertebrata. R. Oldenbourg, Munich, 558 p.
- Briefly described (p. 515) *Echinocaris* and illustrated (fig. 1319) *E. punctata* (Hall), [after an earlier Zittel which, in turn, was] after [modified from] Beecher, 1884. [The illustration is reversed.]
- . 1913. *Text-book of Paleontology*, Vol. 1, Second Edition, edited by C. R. Eastman. Macmillan and Co., London, 839 p.
- J. M. Clarke, in this work, diagnosed (p. 751) the Echinocaridae [*sic*], *Echinocaris*, and (p. 752) *Eleuthero-caris*. Illustrated (fig. 1455) *E. punctata* (Hall), [after an earlier Zittel which, in turn, was] after [modified from] Beecher, [1884]. [The illustration is reversed.] Also illustrated "gastric teeth" [mandibles] of *Echinocaris punctata* (Figure 1451) [modified from Hall and Clarke, 1888]. [At least one reprint edition exists with a later date of publication; that one is dated 1937.]
- . 1915. *Grundzüge der Paläontologie (Paläozoologie)*. Neubearbeitet von Ferdinand Broili. I. Abteilung: Invertebrata. R. Oldenbourg, Munich, 694 p.
- Diagnosed the Echinocaridae [*sic*] and briefly described *Echinocaris* (p. 626). Illustrated (fig. 1368) *E. punctata* (Hall), [after an earlier Zittel which, in turn, was] after [modified from] Beecher, [1884]. [The illustration is reversed.]
- . 1924. *Grundzüge der Paläontologie (Paläozoologie)*. Neubearbeitet von Ferdinand Broili. Vol. 1, Invertebrata. Sixth and revised edition. R. Oldenbourg, Munich, 733 p.
- Diagnosed the Echinocaridae [*sic*] and *Echinocaris* (p. 660) and illustrated (fig. 1377) *E. punctata* (Hall), [after an earlier Zittel which, in turn, was] after [modified from] Beecher [1884]. [The illustration is reversed.] Mentioned the presence (p. 659) of "eye tubercles" on *Echinocaris*.

Index to Generic and Species Taxa Cited

The index lists citations, by author and date, for all references to generic and species taxa of fossil arthropods (excluding trilobites) referred to, or cited as being illustrated, in annotations [but not our bracketed comments] in the bibliography. However, no citations to the genus *Echinocaris* itself are listed, as such a list would be too long to be useful.

In addition to the references to taxa assigned, at one time or another, to *Echinocaris*, the index also lists cit-

tations to other arthropod taxa made in the original literature and mentioned in the annotations. The references to these arthropods are not exhaustive but do, in many cases, provide an entry into the literature on these forms.

The combinations and spellings presented in the index are those of the original author and do not reflect the most recent combinations or the correct spelling of the taxon, necessarily. Current combinations, correctly spelled, are indicated in the index by boldface type.

- Aristozoe**: Gürich, 1929; Hall and Clarke, 1888; Oehlert, 1889.
- Callizoe**: Oehlert, 1889.
- Ceratiocaris**: Gürich, 1929; Newberry, 1873; Vodges, 1889; Whitfield, 1880.
- Ceratiocaris?**: Carll, 1883; Claypole, 1903.
- Ceratiocaris sp.**: Claypole, 1903.
- Ceratiocaris (Echinocaris?)*: Clarke, 1904.
- Ceratiocaris armata* Hall: Bigsby, 1878.
- Ceratiocaris armatus* Hall: Hall, 1863; Hall, 1876; Jones, 1884; Jones and Woodward, 1884; Packard, 1883.
- Ceratiocaris beecheri* Clarke: Clarke, 1885b; Clarke, 1892.
- Ceratiocaris(?) beecheri* Clarke: Chadwick, 1935; Clarke, 1892.
- Ceratiocaris longicauda* Hall: Gürich, 1924.
- ?*Ceratiocaris longicauda* Hall: Clarke, 1892; Hall and Clarke, 1888.
- "Ceratiocaris" longicauda** Hall: Van Straelen and Schmitz, 1934.
- Ceratiocaris longicaudus* Hall: Hall, 1863.
- Ceratiocaris punctata* Hall: Bigsby, 1878.
- Ceratiocaris punctatus* Hall: Vogdes, 1889; Whitfield, 1880.
- Ceratiocaris? punctatus* Hall: Hall, 1863.
- Ceratiocaris (Aristozoe) punctatus* Hall: Hall, 1876.
- Ceratiocaris whitfieldi* Clarke: Clarke, 1902.
- Chagrinihnites**: Frey, Curran, and Pemberton, 1984; Stukel, 1986; Weidner and Feldmann, 1983.
- Chagrinihnites brooksi** Feldmann et al.: Feldmann et al., 1978.
- Chagrinihnites osgoodi** Hannibal and Feldmann: Hannibal and Feldmann, 1983; Weidner and Feldmann, 1983.
- Dithyrocaris**: Stumm and Chilman, 1969.
- Dithyrocaris** (= *Mesothyra*): Rolfe and Denison, 1966.
- Dunsopterus**: Waterston, 1968.
- Dunsopterus stvensoni** (R. Etheridge, Jr.): Waterston, 1968.
- Dunsopterus (?) wrightianus** (Dawson): Waterston, 1968.
- Echinocaris* (= *Ceratiocaris* [*sic*]) sp.: Monroe and Teller, 1899.
- Echinocaris** sp.: Allan, 1935; Baird, 1978; Beecher, 1884;

- Bolton, 1966; Buehler and Tesmer, 1963; Copeland, 1960a; Copeland and Bolton, 1985; Edmonds, Williams, and Taylor, 1979; Feldmann, Boswell, and Kammer, 1986; Gekker, 1941; Goldring, 1971; Hlavin, 1976; Krestovnikov, 1961; McLaren, 1955; McLaren, 1963; Reimann, 1942; Rollins, Eldredge, and Linsley, 1972; Sartenaer, 1969; Sturgeon, Hlavin, and Kesling, 1964; Tschernyshev, 1928; Tschernyshev, 1938; Whitfield, 1892; Willard, 1932; Willard, Swartz, and Cleaves, 1939; Williams and Kindle, 1905.
- Echinocaris? sp.:** Fisher, 1951; Willard, Swartz, and Cleaves, 1939.
- Echinocaris archae* Tschernyshev: Krestovnikov, 1961.
- Echinocaris armata* (Hall): Etheridge, Woodward, and Jones, 1889; Jones and Woodward, 1884.
- Echinocaris armatus* (Hall): Packard, 1883.
- Echinocaris arschae** Tschernyshev: Tschernyshev, 1928; Tschernyshev, 1938.
- Echinocaris asiatica** Reed: Chhibber, 1934; Feldmann, Hannibal, and Babcock, 1986; La Touche, 1913; Pascoe, 1959; Reed, 1908; Vogdes, 1925.
- Echinocaris asiaticus* Reed: Feldmann, Hannibal, and Babcock, 1986.
- Echinocaris auricula** Eller: Copeland, 1960a; Eller, 1935; Feldmann, Boswell, and Kammer, 1986; Hannibal and Feldmann, 1985.
- Echinocaris? beecheri* Clarke (nomen nudum): Clarke, 1891; Clarke, 1898a; Dana, 1895.
- Echinocaris beecheri** Copeland: Bolton, 1966; Copeland, 1960a.
- Echinocaris? brevicarinata** Tschernyshev: Krestovnikov, 1961; Tschernyshev, 1938.
- Echinocaris castorensis** Copeland: Bolton, 1966; Copeland, 1960a; Hannibal and Feldmann, 1985.
- Echinocaris clarkei* Beecher: Grabau and Shimer, 1910; Gurich, 1929.
- Echinocaris clarkii** Beecher: Beecher, 1902; Caster, 1930; Chadwick, 1935.
- Echinocaris clarkii?** Beecher: Castor, 1934.
- Echinocaris condylepis** Hall and Clarke: Chadwick, 1935; Clarke, 1892; Clarke and Ruedemann, 1903; Copeland, 1960a; Eller, 1935; Eller, 1937; Gurich, 1929; Hall and Clarke, 1888; Miller, 1889; Tschernyshev, 1933; Vogdes, 1889; Vogdes, 1890.
- Echinocaris condylepsis* Hall and Clarke: Vogdes, 1890; Vogdes, 1893.
- Echinocaris consanguina** Eller: Bolton, 1966; Copeland, 1960a; Eller, 1935.
- Echinocaris crosbyensis** Eller: Eller, 1937; Jux, 1960.
- Echinocaris longicauda* (Hall): Beecher, 1884; Miller, 1889.
- Echinocaris? longicauda* Hall: Clarke, 1904; Clarke and Luther, 1904.
- Echinocaris longicauda* Hall (*Ceratiocaris longicauda*): Miller, 1889.
- Echinocaris multinodosa** Whitfield: Beecher, 1884; Clarke, 1892; Clarke, 1904; Clarke and Ruedemann, 1903; Feldmann and McKenzie, 1981; Feldmann et al., 1978; Grabau and Shimer, 1910; Gurich, 1929; Hall and Clarke, 1888; Hoover, 1960; Miller, 1889; Rolfe, 1962c; Rolfe, 1981; Sturgeon, Hlavin, and Kesling, 1964; Tschernyshev, 1938; Vogdes, 1889; Vogdes, 1890; Vogdes, 1893; Vogdes, 1917; Weidner and Feldmann, 1983; Whitfield, 1880; Whitfield, 1890; Whitfield, 1899; Willard, Swartz and Cleaves, 1939.
- Echinocaris cf. E. multinodosa** Whitfield: Willard, 1932.
- Echinocaris sp. cf. multinodosa** Whitfield: Sturgeon, Hlavin and Kesling, 1964.
- Echinocaris multinodosus* Whitfield: Packard, 1882; Packard, 1883.
- Echinocaris multispinosis** Feldmann and McKenzie, 1981: Feldmann and McKenzie, 1981.
- Echinocaris ohioensis** Sturgeon, Hlavin, and Kesling: Feldmann and McKenzie, 1981; Feldmann et al., 1978; Sturgeon, Hlavin, and Kesling, 1964; Weidner and Feldmann, 1983.
- Echinocaris pulchra* Sturgeon, Hlavin, and Kesling: Feldmann and McKenzie, 1981; Feldmann et al., 1978; Sturgeon, Hlavin and Kesling, 1964; Weidner and Feldmann, 1985.
- Echinocaris pulcra* Sturgeon, Hlavin, and Kesling: Feldmann and McKenzie, 1981.
- Echinocaris punctata** (Hall): Beecher, 1884; Bernard, 1895; Bigsby, 1878; Brooks, 1957; Brown, 1956; Buehler and Tesmer, 1963; Chadwick, 1935; Chamberlin and Salisbury, 1905; Chamberlin and Salisbury, 1909; Clarke, 1892; Clarke, 1902; Clarke, 1905; Clarke, 1921; Clarke and Ruedemann, 1903; Cleland, 1903; Cleland, 1911; Copeland and Bolton, 1985; Dacqué, 1921; Dana, 1895; Dunkle, 1965; Eller, 1935; Etheridge, Woodward, and Jones, 1889; Feldmann and Hannibal, 1985a; Fenton and Fenton, 1958; Goldring, 1929; Grabau, 1921; Grabau and Shimer, 1910; Grasso, 1981; Gurich, 1929; Hall and Clarke, 1888; Jones and Woodward, 1889; Jux, 1960; Kesling and Chilman, 1975; Krestovnikov, 1960; La Touche, 1913; Lesley, 1889–1890; Miller, 1889; Murphy, 1972; Olsson, 1912; Reimann, 1942; Rolfe, 1962b; Rolfe, 1969; Rolfe, 1981; Rollins, Eldredge, and Linsley, 1972; Schram, 1986; Schuchert, 1943; Shimer and Shrock, 1944; Smith, 1935; Steinmann and Doderlein, 1890; Stumm and Chilman, 1969; Tschernyshev, 1933; Vogdes, 1889; Vogdes, 1917; Willard, 1935; Willard, Swartz, and Cleaves, 1939; Woodward, 1943; Zell, 1985; Zittel, 1880–1885; Zittel, 1887; Zittel, 1900; Zittel, 1903; Zittel, 1913; Zittel, 1915; Zittel, 1924.
- Echinocaris cf. punctata** (Hall): Prosser, 1898.
- Echinocaris punctatus* (Hall): Packard, 1882; Packard, 1883; Scott, 1907; Vogdes, 1889.
- Echinocaris (Ceratiocaris) punctatus* (Hall): Vogdes, 1893.
- Echinocaris* (= *Ceratiocaris?* = *Ceratiocaris* = *Ceratiocaris*

- (*Aristozoe*) *punctatus* (Hall) (= *armatus*): Vogdes, 1890.
- Echinocaris pustulosa** Whitfield: Beecher, 1884; Clarke, 1892; Clarke, 1904; Clarke and Ruedemann, 1903; Grabau and Shimer, 1910; Gürich, 1929; Hall and Clarke, 1888; Hoover, 1960; Jones and Woodward, 1884; Miller, 1889; Vogdes, 1889; Vogdes, 1890; Vogdes, 1893; Vogdes, 1917; Whitfield, 1880; Whitfield, 1890; Whitfield, 1899.
- Echinocaris pustulosus* (Hall): Copeland and Bolton, 1985.
- Echinocaris pustulosus* Whitfield: Packard, 1883.
- Echinocaris randalii* Beecher: Tschernyshev, 1928; Krestovnikov, 1961.
- Echinocaris randalli* Beecher: Caster, 1930; Caster, 1934; Chadwick, 1935; Copeland, 1960a.
- Echinocaris randallii** Beecher: Beecher, 1902; Gurich, 1929.
- Echinocaris randallii?* Beecher: Rolfe, 1969.
- Echinocaris sloliensis* Coomaraswamy: Goldring, 1971.
- Echinocaris sloliensis* Partridge: Butler, 1980; Edmonds, Williams and Taylor, 1979; Partridge, 1902.
- Echinocaris sloliensis** Partridge: Butler, 1980; Edmonds, Williams and Taylor, 1979; Partridge, 1902.
- Echinocaris sociales* Beecher: Eller, 1935.
- Echinocaris socialis** Beecher: Beecher, 1884; Beecher, 1902; Case, 1982; Caster, 1930; Caster, 1934; Chadwick, 1935; Clarke, 1892; Clarke and Ruedemann, 1903; Dana, 1895; Easton, 1960; Eller, 1935; Eller, 1937; Grabau and Shimer, 1910; Gürich, 1929; Hall and Clarke, 1888; Jux, 1960; Lesley, 1889–1890; Miller, 1889; Moore, Lalicker, and Fischer, 1952; Muller, 1963; Partridge, 1902; Roger, 1953; Rolfe 1962b; Rolfe, 1969; Schram, 1986; Shimer and Shrock, 1944; Spinar, 1960; Tschernyshev, 1933; Twenhofel and Shrock, 1935; Vogdes, 1889; Vogdes, 1890; Vogdes, 1893; Vogdes, 1917.
- Echinocaris socialis?** Beecher: Castor, 1934.
- Echinocaris cf. socialis** Beecher: Tesmer, 1975.
- Echinocaris sublaevis* Whitfield: Clarke, 1892; Clarke, 1904; Clarke and Ruedemann, 1903; Eller, 1935; Feldmann and McKenzie, 1981; Grabau and Shimer, 1910; Gürich, 1929; Hall and Clarke, 1888; Jones and Woodward, 1884; Miller, 1889; Shimer and Shrock, 1944; Vogdes, 1889; Vogdes, 1893; Whitfield, 1899; Willard, Swartz, and Cleaves, 1939.
- Echinocaris cf. E. sublaevis* Whitfield: Willard, 1932.
- Echinocaris sublevis** Whitfield: Beecher 1884; Feldmann et al., 1978; Gürich, 1929; Hoover, 1960; Miller, 1889; Packard, 1882; Packard, 1883; Rolfe, 1962c; Sturgeon, Hlavin and Kesling, 1964; Vogdes, 1889; Vogdes, 1890; Vogdes, 1893; Vogdes, 1917; Weidner and Feldmann, 1983; Whitfield, 1880; Whitfield, 1890.
- Echinocaris tudrensis** Tschernyshev: Gekker, 1941; Gekker, 1983; Krestovnikov, 1961; Tschernyshev, 1933; Tschernyshev, 1941.
- Echinocaris turgida** Eller: Eller, 1935; Eller, 1937.
- Echinocaris uralensis** Tschernyshev: Krestovnikov, 1961; Tschernyshev, 1938.
- Echinocaris whidbornei** Jones and Woodward: Butler, 1980; Cleevely 1983; Copeland, 1960a; Edmonds, Williams, and Taylor, 1979; Eller, 1937; Goldring, 1971; Gürich, 1929; Herries, 1896; Jones, 1898a; Jones, 1898b; Jones, 1900; Jones and Woodward, 1889; Jones and Woodward, 1899; Morris, 1980; Partridge, 1902; Vogdes, 1917; Whidborne, 1896a; Whidborne, 1896b.
- Echinocaris whitfieldi* Clarke: Clarke, 1885a; Clarke, 1885b; Clarke, 1891; Clarke, 1892; Clarke, 1898a; Clarke, 1904; Dana, 1895; Hall and Clarke, 1888; Lesley, 1889–1890; Miller, 1889; Schuchert, 1943; Vogdes, 1889; Vogdes, 1890; Vogdes, 1893.
- Echinocaris (=Eleutherocaris) whitfieldi* Clarke: Rolfe, 1969.
- Echinocaris wrightiana* (Dawson): Miller, 1889.
- Echinocaris wrightiana* (Dawson): Jones and Woodward, 1884; O'Connell, 1916; Vogdes, 1893.
- "*Echinocaris*" *wrightiana* (Dawson) (= *Stylonurus? wrightianus*): Copeland, 1960a.
- "*Echinocaris*" (*Stylonurus?*) *wrightianus* (Dawson): Van Straelen and Schmitz, 1934.
- Echinocarys*: Barrois, 1891.
- Eleutherocaris**: Clarke, 1902; Copeland, 1960b; Grabau and Shimer, 1910; Gürich, 1929; Krestovnikov, 1960; Roger, 1953; Rolfe, 1969; Rolfe and Edwards, 1979; Zittel, 1900; Zittel, 1913.
- Eleutherocaris whitfieldi** Clarke: Chadwick, 1935; Clarke, 1904; Clarke and Luther, 1904; Clarke and Ruedemann, 1903; Dana, 1895; Grabau and Shimer, 1910; Gürich, 1929; Schuchert, 1943.
- Eleutherocaris (Echinocaris) whitfieldi* Clarke: Van Straelen and Schmitz, 1934.
- Elymocariss**: Oehlert, 1889.
- Equisetides wrightiana* Dawson: Clarke, 1885b; Dawson, 1881b; Hall, 1884; Jones and Woodward, 1884; Vogdes, 1893; Wright, 1884.
- Equisetites wrightiana* Dawson: Clarke, 1885; Dawson, 1881a; Dawson, 1882.
- Equisetites wrightianus* Dawson: Dawson, 1881a.
- Hebertocaris**: Stumm and Chilman, 1969.
- Montecaris**: Rolfe, 1981.
- Montecaris? sp.**: Dzik, 1980.
- Ohiocaris wycoffi** Rolfe: Rolfe, 1962c.
- Orozoe**: Oehlert, 1889.
- Palaeopalaemon newberryi** Whitfield: Whitfield, 1880; Whitfield, 1892.
- Pephricaris**: Gürich, 1929.
- Pephricaris horripilata** Clarke: Beecher, 1902; Clarke, 1898b; Gürich, 1929.
- Physophyscos bilobatus* Lesquereux: Lesquereux, 1891.

Pseudodontichthys whitei Skeels: Case, 1982; Skeels, 1962.

Ptychocaris: Copeland, 1960b; Hall and Clarke, 1888.

Ptychocaris novaki Copeland: Copeland, 1960b.

Rhinocaris: Stumm and Chilman, 1969.

Rhinocaris columbina Clarke, 1888: Clarke, 1902; Zell, 1985.

Silesicaris: Copeland, 1960b.

Stylonurus: Beecher, 1900; Clarke and Ruedemann, 1912; Hall, 1884.

Stylonurus (?) *wrightiana* (Dawson): O'Connell, 1916.

Stylonurus wrightianus (Dawson): Chadwick, 1935; Clarke, 1904; Vogdes, 1917.

Stylonurus? *wrightianus* (Dawson): Chadwick, 1935;

Clarke, 1904; Clarke and Luther, 1904; Clarke and Ruedemann, 1903; Kjellesvig-Waering, 1961; Kjellesvig-Waering, 1966; Waterston, 1968.

Stylonurus? *wrightianus* (Dawson) (= *Echinocaris wrightianus*): Clarke and Ruedemann, 1912.

Stylonurus (?) (*Echinocaris?*) *wrightianus* (Dawson): Beecher, 1900; Clarke, 1892; Hall and Clarke, 1888.

Stylonurus (= *Equisetides* = ?*Echinocaris*) *wrightianus* (Dawson): Vogdes, 1890.

Stylonurus (*Equisetides*) *wrightianus* (Dawson): Vogdes, 1893.

Stylonurus (= *Equisetides* = *Echinocaris* = ?*Echinocaris*) *wrightianus* (Dawson): Vogdes, 1890.

Trigonocarys lebescontei Barrois: Barrois, 1891.

Tropidocaris: Cleevly, 1983; Oehlert, 1889.